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Report Department of Mines  
Nova Scotia

For the Year ending 30-9-1903

Halifax  
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Annual REPORT

OF THE

DEPARTMENT OF MINES,

NOVA SCOTIA,

1904/05  
For the Year ending 30th September, 1903.



HALIFAX, N. S.

COMMISSIONER PUBLIC WORKS AND MINES, KING'S PRINTER,

1904.

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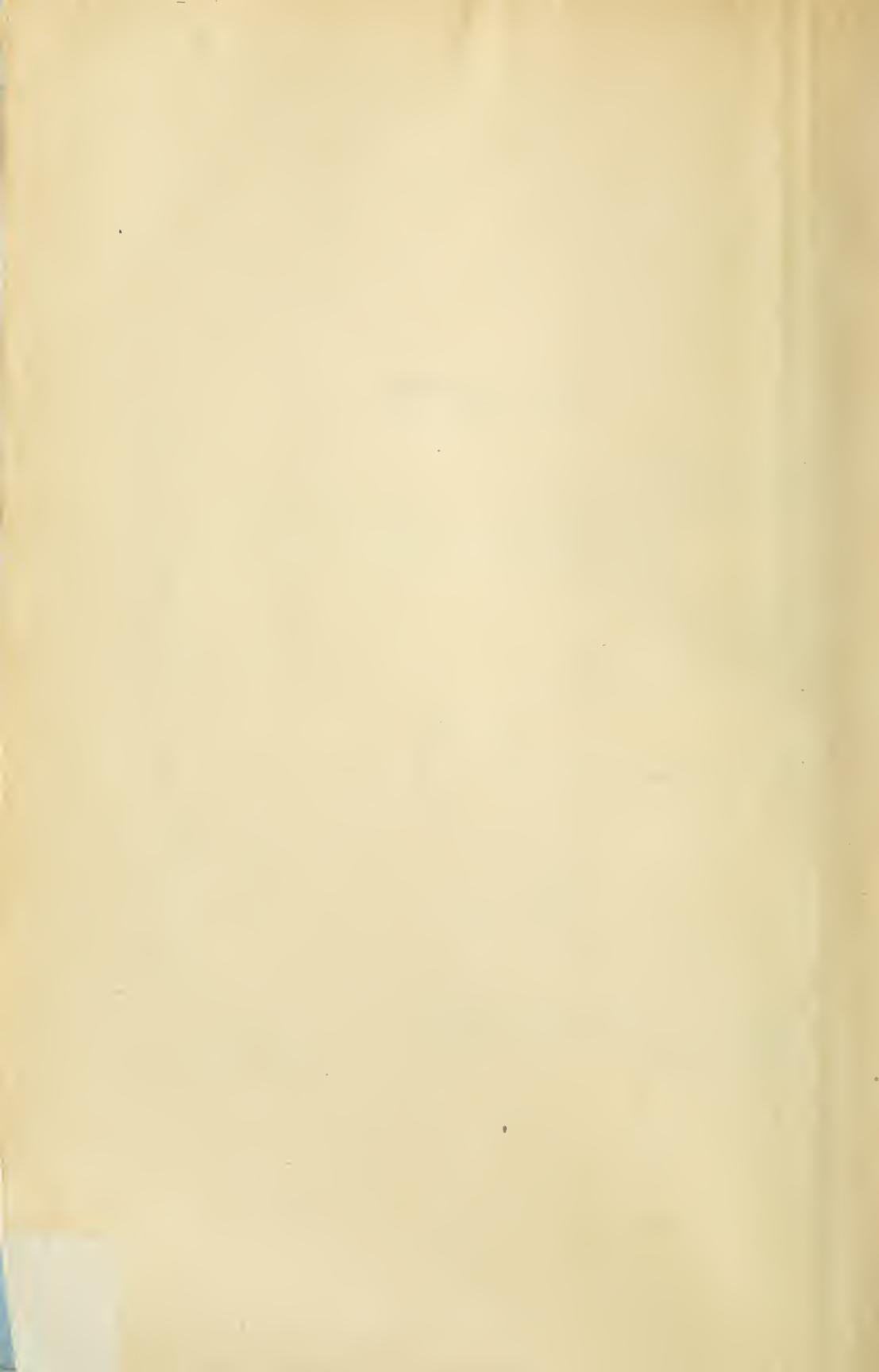
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E. R. Faribault,	



# DEPARTMENT OF MINES.

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REPORT FOR THE YEAR ENDED SEPTEMBER 30, 1903.

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To His Honour THE HONOURABLE ALFRED GILPIN JONES,  
*Member of the King's Privy Council for Canada,*  
*Lieutenant-Governor of Nova Scotia, &c., &c.*

MAY IT PLEASE YOUR HONOUR,—

I respectfully present herewith to Your Honour the Annual Report of the Inspector of Mines, containing an account of the progress of mining operations, together with statistical information compiled by him from official and other returns.

I am,

Your Honour's obedient servant,

A. DRYSDALE,  
*Commissioner of Public Works and Mines.*

HALIFAX, December 10th, 1903.



# REPORT ON THE MINES OF NOVA SCOTIA.

BY EDWIN GILPIN, JR., A.M., LLD., DCL.,

COMPANION IMPERIAL SERVICE ORDER. FELLOW OF THE ROYAL SOCIETY OF CANADA, ETC., ETC.

OFFICE OF INSPECTOR OF MINES,  
HALIFAX, December 9th, 1903.

TO THE HONOURABLE A. DRYSDALE, M.P.P., M.E.C.,  
*Commissioner of Public Works and Mines:*—

SIR,—I beg leave to submit the following report on the Mines of Nova Scotia.

The following summary shows, so far as I have been able to learn, the Mineral production of Nova Scotia for the year ended September 30th, compared with that for the year ending September 30th, 1902.

	Year ended Sept. 30, 1902.	Year ended Sept. 30, 1903.
Gold.....oz.	28,279	25,198
Iron Ore*.....Tons	489,731	415,192
Manganese Ore†....."	150	.....
Coal raised†....."	4,362,869	5,245,247
Coke made†††....."	406,152	392,600
†Gypsum†††....."	173,000	175,850
Grindstones, etc.†....."	4,000	650
Limestone†....."	223,606	262,544
Barytes†††....."	550	897
Pig Iron†....."	206,193	194,444
Moulding Sand†....."	1,390	240
Steel Ingots†....."	.....	180,434

\* Including imported ore, 379,179 tons.

†Ton of 2,240 lbs.

†† Net tons.

† Amount exported.

## MINES REPORT.

STATEMENT SHOWING AMOUNTS AND SOURCES OF REVENUE RECEIVED BY MINES  
DEPARTMENT DURING YEAR ENDED SEPTEMBER 30th, 1903.

	1ST QUARTER.	2ND QUARTER.	3RD QUARTER.	4TH QUARTER.	TOTAL
Prospecting Licenses, (apps.) .....	2604 50	1673 50	2251 50	2764 50	9294 00
Rents, (gold lease apps.) .....	1654 00	798 00	1416 00	1868 00	5736 00
Gold Rentals .....	2088 00	726 00	3270 00	7891 00	13975 00
Licenses to Search (apps.) .....	6870 00	9900 00	8760 00	4560 00	30090 00
Lease apps. (other than gold or silver) .....	1600 00	850 00	550 00	2000 00	4500 00
Rents (other than gold or silver) .....	3000 00	690 00	5250 00	12450 00	21390 00
Gold Royalty .....	3439 04	1865 98	1929 08	2052 54	9286 64
Coal Royalty .....	153013 18	134310 08	118492 97	117548 08	523364 31
	\$173768 72	\$150813 56	\$141919 55	\$151134 12	\$617635 95
Fees .....					\$1598 32
					\$619234 27
Less amount refunded on each ton of coal consumed in the manufacture of iron and steel in Nova Scotia, as follows:					
April 24, 1903, Dom. Iron & Steel Co., at 6½c. per ton					\$3,4947 59
June 12, 1903, N. S. Steel & Coal Co., at 5c. "					8066 06
July 14, 1903, Dom. Iron & Steel Co., at 6¼c. "					9170 57
					\$52184 22

During the past year Mr. R. W. McKenzie continued the survey of coal and other leases in Cape Breton County. Mr. Lambert Lynn surveyed the Port Hood leases, and the Chimney Corner district. Surveys were made by Mr. C. W. Pye and others in a number of the gold districts.

The minerals exhibited at the Paris exhibition and at numerous places in England, were returned during the summer. Mr. Piers, the curator of the Provincial Museum, was employed for some time during the summer in making a fresh collection of our economic minerals. This was shown at the Provincial Exhibition and attracted much attention. It is proposed to maintain this collection as the basis of an annual demonstration of our mineral resources at the Provincial Exhibition. A brief catalogue and description of the minerals exhibited will be found at the end of the report.

The museum is, in a number of lines, approaching a comprehensive exhibit of our natural resources. It is found that the number of visitors for the purpose of study increases with the improvements made in the state of completeness of the various branches.

The Science Library has been enriched by a number of new books and exchanges, and is being more and more consulted. A report from the curator is appended on the Museum and Library.

The schools for colliery officials and enginemen were held as usual. It is proposed to widen the system of enginemens' certificates.

The subject of deep gold mining is receiving the consideration of your Honourable Government, and a report from Mr. Faribault, of the Canadian Geological Survey, on this subject is appended.

The Departmental drills have been kept busy during the year, and will be more fully referred to in a report by Mr. Darcy Weatherbe.

## COAL TRADE.

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The returns of coal sold during the year 1903 show, when compared with those of 1902, as follows:

	1902	1903
Nova Scotia.....	1,382,563	1,605,477
New Brunswick.....	319,338	376,722
P. E. Island.....	56,203	78,472
Newfoundland.....	105,287	133,162
Quebec.....	1,243,980	1,403,916
West Indies.....	5,982	.....
United States.....	751,382	968,832
Other Countries.....	33,891	54,493
 Total.....	 3,898,626	 4,621,074

The production was 5,245,247 tons compared with 4,366,869 tons in 1902.

The sales in Nova Scotia show an increase of 222,914 tons.

The sales to New Brunswick, Prince Edward Island, and Newfoundland all show a substantial increase.

The Quebec sales increased 159,936 tons, and those to the United States increased 217,450 tons.

### CUMBERLAND COUNTY.

During the past year the production was 593,475 tons, compared with 544,917 tons in 1902. The Springhill Collieries raised 500,572 tons, and the Joggins Mines raised 16,107 tons.

### PICTOU COUNTY.

This County produced last year 697,743 tons, compared with 515,603 tons in 1902. The Acadia Company raised 397,449 tons, and the Intercolonial Company raised 249,448 tons. The Marsh Colliery of the Nova Scotia Steel and Coal Co., produced 50,846 tons, consumed at their works in the County.

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The following report by Mr. A. V. Cameron, Deputy Inspector, will give details of the work done at the Collieries in his district.

SPRINGHILL, Nov. 12th, 1903.

E. GILPIN, JR., ESQ.,

*Deputy Commissioner and Inspector of Mines.*

SIR:—I beg to hand you herewith a report on the mines in the districts of Cumberland and Pictou, up to the 30th day of September, 1903.

SPRINGHILL.

No. 1. SEAM.

I mentioned in my last report that No. 1 slope had been abandoned. This seam has been worked beyond the Aberdeen fault from No. 2 slope. At this point the seam was split and when levels had been driven about 2,000 feet in each division, the coal became very thin. It was then decided to draw the pillars from the face backwards, which work has been successfully carried out during the year.

No. 2 SLOPE.

On the west side of this slope the extraction of pillars has been continued. In the cross-section tunnel nothing further has been done.

In the West Aberdeen workings bord and pillar work has been carried on to the rise of the level, the extent of the workings being limited by the fault. Some of the pillars have also been drawn from the rise east of the Aberdeen slope. A permanent air course was left, also 450 feet of solid coal toward the crop.

The East Aberdeen levels have been extended 2,513 feet, making a total distance from the slope of 10,395 feet.

The Aberdeen slope itself has been extended 1152 feet. This slope is in the very best of coal, the average height being about 9 feet, without partings.

Since the fire in No. 1 slope the lower part of No. 1 and No. 2 slopes has been left filled with water.

About the latter part of May the work of pumping out and re-timbering the slopes was commenced. Although the work was difficult, owing to the heavy falls, in some places, 20 feet high, good progress has been made, and at the close of the year about 300 feet were cleaned out and well timbered.

The level haulage in this slope, which was installed last year, has been working for several months with 40 boxes per trip, and has proved satisfactory.

#### No. 3 SLOPE.

At this slope work has been confined principally to the 2,600 and 3,200 feet lifts. Pillars were extracted from the former lift throughout the year. In the latter lift the working of both pillars and bords is progressing backward from the face toward the slope. About the first of May the work of driving the 3,800 feet levels to the east and to the west was commenced. The former are now in 280 feet, the latter 687 feet. At the face of the east levels a tunnel is being driven to the bottom seam and is now in about 250 feet.

At No. 2 slope a steel smoke stack 80 feet high, and four feet in diameter, has been placed on a brick base. A new Jeansville 8 in. by 4 in. by 8 in duplex boiler feed pump has been erected. A Capel fan, 18 ft. by 4 ft. is now being constructed. The engine for this fan is being built by the Robb Engineering Co. Its size is 20x20 inches with adjustable cut-off. There is installed on the surface of No. 2 a pair of direct acting link reversing hoisting engines, fitted with cast iron drums 7 feet in diameter, 5 feet face with flanges, to hold 6,000 feet of  $1\frac{1}{4}$  inch round rope.

On the surface of No. 3 slope there has been erected a double inlet direct connected Capel blow down fan with a capacity of 150,000 cubic feet per minute.

The fan is 22 feet in diameter and 3 feet 6 inches in width, with an engine 24x24 inches.

At the surface of No. 5 slope a pair of winding engines 16x20 inch cylinders, have been placed on a concrete foundation, and engine-house built, and covered with iron. Two new Mumford tubular boilers have also been placed here.

During the summer work has been nearly completed on 25 double and 6 single dwelling houses. The company has installed a water system at Maccan River, about two miles away. At this point there is a 28x11 $\frac{1}{2}$ x36 inch Blake pump, discharging on an average 500 gallons of water per minute into the reservoir near the works. The pipe line has 5,500 feet of 8 inch, and 4,500 feet of 6 inch wrought iron pipe.

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MINUDIE MINE, RIVER HEBERT.

During the past year the Company stopped raising coal from No. 2 slope, and are now working No. 1 slope. The lift spoken of in my last report has been finished. New levels have been driven east and west, and two balances opened. One is now working 7 bords on the long wall system, and the other will shortly be ready.

On the opposite or east side of the slope there is one balance working with 6 bords and another driving. The new sinking will make the slope when completed 1,300 feet in length. The company are arranging to put a picking table and a ventilating fan on the surface.

## JOGGINS MINES.

There is nothing special to be noted at this mine. Operations were carried on steadily during the year. On the 2,500 ft. level at a distance of 1,950 feet from the slope, the large western upthrow fault was cut. This fault has a displacement of about 30 feet. Both levels were driven through this fault, and are 2,250 feet from the slope. The extraction of pillars has been continued in this section. The east levels of the 3,100 ft. lift were started in a downthrow fault of about 18 feet. At about 800 feet from the slope a second or upthrow fault of about 12 feet was driven through. The coal is being mined near the second fault by four uphill gateways with a 60 ft. pillar above the high level. Between these faults there is a double balance now about half way up. The clay in this section is about 14 inches thick. At the same landing the west levels have been extended a distance of 1,550 feet. The extraction of pillars will shortly be commenced in the No. 1 balance. No. 2 balance is commencing bord work. No. 3 and No. 4 balances are in course of development. The main and pipe slopes are about 100 feet below the bottom level. A new lift will be sunk as soon as the main slope is equipped with a double road. The removal of two boilers from No. 3 slope to the No. 2 slope will give the power for an increased output. In July a new exhaust fan was put into operation. This fan is 18 ft. by 3 ft.; on a concrete foundation together with the engine. The mine generally, is in good shape.

## SCOTIA MINE.

The new lift, mentioned in my last report on this mine, was finished early in the year, and levels turned away. It is proposed to sink another lift of about 100 feet this winter. A new air course has been driven through to the surface, which has improved the ventilation.

## STRATHCONA MINE.

The different levels in this mine have been extended quite a distance during the year. No. 1 level east, was driven 460 feet. No. 2

level east was driven 760 feet. No. 3 level was driven 250 feet and No. 4, 190 feet.

The No. 1 level at 260 feet was driven through the second fault.

No. 2 level west was driven through two faults.

No. 3 was driven to the first fault.

This slope is now 716 feet from the surface. I am informed that the prospecting carried on during the summer resulted in the discovery of a four feet seam of good clean coal.

#### FUNDY COLLIERY, JOGGINS DISTRICT.

This mine was formerly known as the Hardscrabble. A slope was sunk about 500 feet and levels turned off on both sides. I trust that next year I will be able to report considerable progress at this colliery, as the company seem prepared to extend their operations as rapidly as possible.

#### CHIGNECTO MINE, MACCAN.

This colliery has been worked by the Maritime Coal Company during the past year. The company have now completed sinking to a depth of 1,400 feet with levels turned away at 1,000 feet, and at 1,400 feet. There are two balances in operation on the 1,000 feet level, and two being completed on the 1,400 feet level. The ventilation at this mine is in good shape. The fan running at 30 revolutions gives ample ventilation. The boiler plant has been increased by two more tubular boilers. Twenty-two new houses have been built for the workmen, and a new store and office.

N. B.—Referring to my last report there was an error. The two last paragraphs, under the head of Chignecto Mine, pages 17 and 18, did not apply to this mine, but the three last paragraphs under the heading, No. 3 slope, Joggins Mine, pages 12 and 13, should appear in the Chignecto report.

#### DEBERT MINE, COLCHESTER COUNTY.

#### COLCHESTER COAL AND RAILWAY CO.

This Company is starting to open up a seam of coal on the Debert River, which measures about 4 feet 6 inches of excellent coal, free from sulphur and suitable for coking. They have started a slope which is now about 150 feet deep. The ultimate depth of the slope

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is expected to be about 1,200 feet. An old slope about 60 feet to the eastward, which was sunk about 15 years ago, will be opened out and serve as a back slope. The necessary engine, boiler and pumping equipment is being placed at the bankhead. The seam dips at an angle of 28 degrees, and is said to be unusually dry. The route for a branch railway, about four miles long, from Debert Station to the colliery has been surveyed and presents no engineering difficulties.

#### MARSH COLLIERY, PICTOU COUNTY.

The Nova Scotia Steel and Coal Company have worked this mine steadily during the year. The slopes have been extended until they are now 2,175 feet long. Working levels have been turned off to the west on the main slope at a depth of 1,686 feet, and are now in about 120 feet.

At the 1,375 ft. level a new haulage engine has been placed in position. It is of the Webster Camp and Lane Co. standard, 5 in. by 6 in. cylinder and two drums 20 in. by 6 in.

No. 1 balance on these levels is driven through to the top levels, and has eight bords. No 2 is partly in operation. A new wash-house has been built for the men and is supplied with hot water and steam heat.

#### ACADIA COLLIERY, WESTVILLE.

During the past year work has been continued in the No. 10 and 11 lifts. No. 12 lift has been sunk 300 feet and levels will be turned off north and south. In the No. 10 lift south, the coal is being steadily won outwards. No. 2 jig has been driven through and the balances are being worked toward the levels. No. 1 jig has also been put through, and the extraction of pillars commenced at No. 9 level.

There are pillars still awaiting extraction in Nos. 1, 2, 3, 4, 5 and 6 jigs, and there is also a 600 feet pillar inside of No. 6. In No. 10 lift north there is a pillar 600x65 feet to be taken out. The south levels in No. 11 lift are in about 2,600 feet, and No. 2 and 3 jigs have been put through to the No. 10 lift. Nos. 4, 5 and 6 jigs are under way.

The north levels in No. 11 lift were advanced about 700 feet in faulty ground, and are now standing. A return airway has been driven up through No. 7 lift and connected with No. 6. Other changes are being made in the air courses, and a more powerful fan put in place which will probably improve the ventilation considerably.

The new bankhead completed last January is giving entire satisfaction. The boilers have been placed alongside the winding engine under the same roof. The compressor plant has been moved to a position by the fan-house.

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ALBION MINES, STELLARTON.

These mines have been worked steadily during the year. The haulage of water at the Foord pit engine by tanks has been stopped. Arrangements have been made to handle the water in the lowest seam, McGregor pit, where the large Jeansville pump is located. The water is collected from the Cage pit and Third seams in the McGregor pit where there is to be a lodgement holding 1½ million gallons of water. From this point it will be discharged by the new pump. The McGregor pit is about ready to start sinking; preparations are being made for using larger boxes, etc. In the third seam slope electric signal bells have been installed, and another sinking is in progress. The south side levels in the third seam struck an up-throw fault, where the coal is inferior.

Improvements have been made in the boiler plant, pumps, etc. In order to secure the water supply for the boilers, a 4 in. pipe has been laid for a distance of 3,200 feet to connect with the Stellarton water works.

It is stated that the company have in contemplation the sinking of two new shafts to the dip of the Foord pit for the purpose of regaining the well known Albion Main seam.

## VALE COLLIERY.

The operations in this mine were principally in the new sinking on the north level. Five new balances were started during the year. The sinking was driven a distance of 500 feet, and when stopped was in good coal. In July an underground stream of water was cut in the north level which gave 16,000 gallons of water every twenty-four hours. This water worked down to the sinking faces. An attempt was made to keep it out by boxes, but the haulage distance was too long. After some trouble, other arrangements were made by which the water was taken off the faces. On the north levels work is being carried on. Pillars are being drawn in No. 3 and 4 balances. On the west side the levels were driven in 1,200 feet, and showed good coal. The output was 450 tons a day. Improvements have been made on the surface to the boiler plant, new houses, built, etc.

## DRUMMOND COLLIERY,

No. 1 slope has been driven 498 feet and is now 400 feet below No. 15 lift, and 6,538 feet from the surface. No. 2 slope has been advanced 692 feet. No. 14 south main level has been advanced 1,268 feet, and is now 3,677 feet from No. 1 slope. No. 5 balance, 14 south, was completed in July and is 580 feet long. Other levels and workings have been systematically advanced. The tunnel to the third seam has been advanced 200 feet from the Scott Pit.

## No. 4 SLOPE.

In this slope development is progressing satisfactorily, the workings from the bottom of the slope being extended into a section which some years ago was abandoned as the coal was thought inferior. The seam now turns out about 7 feet of very good coal.

## MISCELLANEOUS.

I may add that there has been some prospecting work done at South Ridge about 15 miles below Oxford in Cumberland County, and also in the neighborhood of Parrsboro, but I have not heard of any valuable discoveries.

I visited the Londonderry Iron mines during the year and found the levels and drifts well timbered and ventilated.

## CAPE D'OR COPPER MINE, CUMBERLAND CO.

Since my last visit, development work at this mine has been continued underground.

In No. 1 shaft the west tunnel was driven 82 feet; the southeast tunnel was driven 151 feet from the slope, going in a southwardly direction from the west tunnel 150 feet. The crosscut from the bottom of this slope was driven until it reached a distance of 398 feet. In the Bennet Brook shaft all the working places were extended a short distance. A good deal of work was also performed in the No. 2. or Hanway Lode. During the year, at this point, two large and one small hoisting engines, one Rand duplicate air compressor, and one 100 horse power boiler were installed. The pumping power of the property has also been increased.

On the 30th of June, James Kendall, miner, was killed through carelessness in picking out dynamite that had failed to detonate.

## CUMBERLAND COPPER CO., EAST WENTWORTH.

This company succeeded the Munroe-Thompson Company, early in the present season. The new company has built a laboratory, and completed the roaster, etc. They claim now to have a complete reduction plant. During the year very little underground work has been performed, but the company claim that they have a considerable amount of rich ore in sight.

I append summary of accidents, and remain,

Yours truly,

A. V. CAMERON,

*Deputy Inspector of Mines.*

## ACCIDENTS DURING THE YEAR.

No.	DATE.	MINE.	NAME.	OCCUPATION.	REMARKS.
	1902.				
1	Oct. 28	Drummond Colliery.	Thomas Ross .....	Laborer.....	Slightly injured on surface, struck by boxes.
2	Feb. 5.	Acadia Mine .....	Wm. O'Brien .....	" .....	Leg broken by moving box.
3	Mar. 3.	Drummond Colliery.	Hugh Stewart.....	Boy .....	Collar bone broken.
4	" 3.	Albion Mines .....	Wm. McKenzie .....	" .....	Leg broken by jumping on train ; died March 4th.
5	Feb. 17.	Drummond Colliery.	Isaac Abbot.....	Laborer .....	Arm broken.
6	Jan. 29.	Acadia Mine .....	James McLeod .....	" .....	Hurt on main slope by moving rake ; died February 15th.
7	Mar. 9.	No. 3 Springhill.....	John Morrison .....	Loader.....	Leg broken by a fall of coal.
8	Feb. 4.	"	Henry Fisher .....	Miner .....	Instantly killed by a fall of coal.
9	Jan. 28.	Albion Mines .....	Andrew Hayes.....	Loader .....	Leg and knee joint injured.
10	Nov. 24.	No. 2 Springhill.....	James G. Wilson .....	Pick Stancher	Fatally injured by a full rake of boxes.
11	Apr. 1.	No. 3 Springhill.....	Chas. L. Purdy .....	Miner .....	Killed by a fall of rock.
12	Oct. 10.	Albion Mines .....	George Munroe .....	" .....	Leg broken and other injuries.
13	May 11.	Vale Colliery .....	Murdock McLeod..	" .....	Hurt by a fall of stone.
14	June 2.	Drummond Colliery	Wm. Hale .....	Shute Tender	Hurt by being jammed against rib by runaway box.
15	" 21.	Acadia Mine .....	Chas. Stewart .....	Laborer .....	Back hurt ; caught between box and roof.
16	" 8.	" .....	Stephen Wadden .....	.....	Hurt by riding rake.
17	" 11.	Minudie Mine.....	.....	Loader.....	Hurt by a fall of roof stone.
18	" 12.	Springhill . ....	Oscar Hanson.....	Shiftman .....	Arm broken by being caught between boxes.

19	"	28. No. 2 Springhill.....	John McMillan.....	"	....	Fatally injured by being jammed between box and roof.
20	"	13. Vale Colliery .....	James O'Brien.....	Laborer .....	Compound fracture of leg.	
21	July 13.	Drummond Colliery .....	Daniel Finlay .....	Shiftman .....	Killed by rake in hoisting slope.	
22	" 22.	Vale Colliery .....	Harry Wambolt .....	Miner .....	Killed by a fall of stone at face of working place.	
23	" 25.	Chignecto Mines.....	F. Blenkhorn .....	Boy .....	Injured by cage.	
24	Aug. 1.	Albion Mines .....	Rod. McKenzie.....	.....	Leg broken by a fall of coal.	
25	" 25.	Drummond Colliery .....	John W. Ryan.....	.....	Fatally injured.	
26	Sept. 5.	Albion Mines .....	George Forrestall.....	.....	Hurt by jumping off moving cage.	
27	" 26.	No. 2 Springhill.....	Geo. Cunningham.....	Day Examiner.....	Hurt by empty rake at bottom of slope; had leg broken.	

## CAPE BRETON COUNTY.

The sales from this County amounted to 3,279,905 tons against 2,924,967 tons in 1902. The production of the Dominion Coal Company shows an increase, being 3,283,117 tons compared with 2,952,758 tons in 1902. The Nova Scotia Steel and Coal Company raised 397,366 tons against 241,891 tons in 1902.

The Cape Breton Coal and Railway Company have acquired large tracts of coal lands in the rear of Cow Bay and are arranging for operations on a large scale.

During the past year Mr. P. Neville, who discharged the duties of Deputy Inspector for the Island of Cape Breton found the work too arduous, owing to the new mines in Inverness County and the increasing extent of the Glace Bay mines and resigned his position.

His duties, often of a delicate and arduous character, were discharged in a manner most acceptable to the Department, and his sincerity and conscientiousness secured the respect of managers and workmen. His long experience in the mining districts is still at the service of the Department. The work of the Inspector has been divided between two deputies, Messrs. John Cadegan and Neil A. Nicholson. The former taking the southern and the latter the northern half of the inspection work.

The Inverness County mines at Broad Cove and Port Hood have continued to increase their output. At Mabou the preliminary work of development is being pushed as fast as possible.

The appended reports will show the progress made last year in the Cape Breton mines.

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OLD BRIDGEPORT, December 2, 1903.

E. GILPIN, JR., Esq.,

*Deputy Commissioner and Inspector of Mines.*

SIR,—I beg to submit my report on the northern division of the mining district of the Island of Cape Breton.

The coal production of this division has increased with much rapidity. I am pleased to be able to report that the management of the collieries have complied with the mining law. Owing to the

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rapidity of the increase of the workings and of the amount of explosives used, the ventilation of these mines has become an important matter. The number of men employed without experience in mines has added materially to the list of accidents.

The fire at Dominion No. 1 has shown the necessity of correct plans, of strict attention to the principles of mining, and to the necessity of barriers between large collieries.

The fatal accident at the Reserve Colliery pointed out clearly the necessity of strict discipline in all matters relating to the handling of gas and the admission of workmen to the faces.

I refer in some detail to the fire at Dominion No. 1.

#### INVERNESS COUNTY, PORT HOOD COLLIERY.

This colliery worked steadily throughout the year, and more than doubled its output. The slopes were extended 70 feet. The north level is now in 2,400 feet; the south level is in 1,500 feet, and is standing against a fault which has not yet been cut.

No. 2 level south passed through two faults which are 250 feet apart, and 93 and 100 feet thick respectively.

The mine is in good condition, being well ventilated and securely timbered. The slopes are in submarine areas, and 400 feet under the water. At the entrance to the submarine coal the strata are 340 feet thick.

On the surface more miners' cottages, etc., have been built. The bankhead has been fitted up with slack pockets to hold 500 tons, and are provided with a Jeffrey conveyor. New pockets were also added to the wharf.

#### MABOU.

The No 2 slope at this colliery has been driven 650 feet. Levels were turned away at 400 and 500 feet. After the slopes had been driven 580 feet the coal was found to change suddenly from an angle of 75 degrees to one of 8 degrees. The slopes are now being altered to meet the new dip.

The No. 3 slope is down 450 feet, where levels were turned away at the face. A large bankhead has been fitted up with modern machinery, an air compressor placed in position, and other parts of the plant completed. The railway referred to in the last report is completed.

### INVERNESS COLLIERY, BROAD COVE.

At this colliery the slopes of No. 1 mine have been driven 400 feet further, under the sea, and have at this point a thickness of 350 feet of overlying strata. The East and West levels have been materially extended during the season. A Northeby pump has been placed on the No. 3 level, forcing the water to the Cameron pump on the No. 2 level. Two lodgments capable of holding 200,000 gallons have been completed. A Walker fan giving 250,000 cubic feet, with a 2 inch water gauge, has improved the ventilation.

No. 2 slope is 2,558 feet from No. 1, and its course diverges from it. It is proposed to connect No. 2 with No. 1. When this is done No. 2 will cease hoisting until the surface plant is completed. The old workings to the rise which were on fire were opened out and traversed. Shortly after the fire reappeared, when these workings were at once walled up. A level has been driven 900 feet in the crop coal and it is proposed to take out everything to the rise.

The wharf at Port Hastings has a storage capacity of 4,500 tons. Shipments were made all last winter from it, there being no hindrance from ice. The distance from the mine to the wharf is 61 miles.

I give the following list of machinery installed at this colliery, thinking that it may be of interest as showing the system at present adopted in working Cape Breton collieries.

#### No. 1 COLLIERY.

One hoisting engine made by the Dickson Mfg. Co., Scranton, Pa., consisting of a pair of 16x30 inch engines, geared to 2 friction drums 8 feet by 3 ft. 6 inch, grooved for  $1\frac{1}{8}$  inch rope.

One Ingersoll-Sergeant Air Compressor made by the James Cooper Mfg. Co., Montreal, P. Q., with cross compound Corliss Steam Cylinders 20 and 36 by 48 inches, and compound air cylinders  $19\frac{1}{4}$  and  $32\frac{1}{4}$  by 48 inches.

One Electric Light Unit with a nominal capacity of 800, 16 candle power lights, consisting of a 12x12 inch Robb-Armstrong engine direct connected to a 50 Kw. 125 volt C. G. E. generator, controlled by a marble panel switchboard of the usual type, supplied by the Canadian General Electric Co.

One 18x7 ft. Walker "Indestructible" ventilating fan, rope driven from a 14x30 inch Walker engine. The fan has a steel plate housing and is fitted with Walker Bros. patent "Anti-Vibration" shutter, which makes it run very smoothly, and practically noiseless in operation. It is arranged to work either exhausting or blowing, and the

change from one to the other may be made by a couple of men inside of fifteen minutes without stopping the fan. All bearings are fitted with self-oiling rings and the two at the inlets have dust shields.

The engine is of the single cylinder slide valve type, fitted with Meyer expansion valves, and is of very substantial construction throughout. The drive consists of five  $1\frac{5}{8}$  inch diameter patent interstranded cotton ropes, running off a 12 ft. pulley on the engine to a 9 ft. pulley on the fan shaft.

The rated capacity of the fan is 250,000 cubic feet on a 2 inch water gauge.

One Heine Patent Water Tube Boiler of 300 nominal H. P. made by the Canadian Heine Safety Boiler Co., Toronto, Ont., fitted with Sturtevant Induced Draft Apparatus with stack, Y connection and fan and engine for a second boiler of the same capacity.

#### No. 2 COLLIERY.

One  $6\frac{1}{4} \times 8$  inch Double Cylinder Single Friction Drum Hoisting engine, made by the James Cooper Mfg. Co.

Two Upright Tubular Boilers rated at 14 and 20 H. P. each.

There is now in course of erection on the bank at No. 1 Colliery a slack conveyor, bucket elevator and knocking screen for separating the duff from the slack passing through the present shaking screen, and also a creeper for pushing the empty boxes over the grade on the bankhead. These will be driven by continuous rope gearing from an 8x10 inch upright engine supplied by the Brown Machine Co., of New Glasgow.

#### VICTORIA COUNTY, NEW CAMPBELTON.

A creep on the slope in the early part of the season gave much trouble, and interfered with the pumping. Before the water was overcome the season was too far advanced to permit of much shipping. The workings on the lower level had to be abandoned for a time, and work was confined to the upper lifts. The old level was cleared out and retimbered. The company propose opening a new slope to the north of the present workings.

#### CAPE BRETON COUNTY.

#### NOVA SCOTIA STEEL AND COAL COMPANY, SYDNEY MINES.

The output of this company shows an increase of 155,475 tons over last year. This is largely due to the development of No. 2 and No. 3 collieries. In No. 1, hitherto known as the Sydney Mines, the deeps have been extended 800 feet and workings opened out, pillars

have been extracted toward the boundary line, and in the new "Queen" pit workings, owing to the length of the haulage from the deep on the south side of the shaft, a passageway was opened through the crushed district, in order to form an endless haulage road instead of the trip system. The haulage engines are on the surface. A new Jeansville pump of large size, for the purpose of assisting the Cornish pump at the bottom of the shaft, has been placed, thereby materially concentrating the pumping work. This colliery is still under the closed light law. Compressed powder is generally used, and its use should be continued, as one section of No. 1 South is dry and dusty, and no explosives causing windy shots should be permitted to be used.

#### SYDNEY MINES, No. 2 COLLIERY.

The slopes are now 2,600 feet long, having crossed the shore line 1,600 feet from the crop. The cover at the shore line is 104 feet. This thin cover forces the Company to drive 3,400 feet from the crop to their first lift of 450 feet. This slope is in what is known as the Lloyd's Cove seam. This seam is principally mined by machines. There is a fan shaft and Capel fan.

#### SYDNEY NO. 3 COLLIERY.

During the year this slope has been sunk 1,600 feet. Three lifts have been opened, coal extracted, and 200 feet of a barrier left next the crop. This seam is also to be mined by machinery. The mine is being equipped with a substantial and efficient supply of machinery.

The starting of the steel plant has led to many improvements at Sydney Mines. Under the offer of cheap land and time payments, many miners are building houses for themselves. A large number of single and double cottages have been built by the Company. The accident list at this colliery is large. Seven miners were injured fatally, and seven met with accidents. More care is necessary on the part of both the company and the men.

#### SYDNEY COAL COMPANY.

The output of this colliery was a little larger than last year. The levels have been extended and are now 2,290 feet from the mouth of the drift. The ventilation, which is natural, is fair.

#### DOMINION NO. 1.

Owing to the fire (March 19th) the regular output of the colliery, which is nearly 400,000 tons, is much below that of last year. After extinction of the fire, the work of re-opening was commenced and

carried on as fast as possible. About 1,000 tons a day are now being taken from the upper workings. Bodies of gas are met with as the water is lowered. These are removed when the men are out of the mine. Work is being carried on with closed lights, and safety explosives are recommended until the mine is in thorough order again.

#### DOMINION No. 1, FIRE.

The following memorandum on the operations connected with the fire at this colliery may be of interest. On March 19th, about 3.30 a. m., fire broke out in a cross-cut between the north main deep and the back deep. Some men riding up the deep in a box noticed heat and smoke, after passing this cross-cut which is some distance from the bottom of the pit. Instead of endeavoring to put out the fire, which when they were there was apparently inconsiderable, they went and notified the official in charge. He summoned assistance, and with a couple of men did what he could to put out the fire which was now rapidly growing larger. There was some little delay before assistance arrived, and the fire was then spreading rapidly. For some time a hand to hand fight was maintained with the fire, firemen from Sydney being called upon for assistance. It was soon found that it was impossible to prevent its spread, and the air was shut off as much as possible by stoppings. In the meanwhile dams were being built at every opening below the fire with a view to confining the water, and forcing it back upon the fire. An attempt was made to work in above the fire from the angle deep to the north. After carrying in an air-current through a heavy body of damp and smoke for 1,000 feet, fire was seen to have travelled up the deeps so as to be ahead of this opening. It was also apparent that the fire had worked its way into the crush where the pillars had been taken out between the north main deep and the angle deep. It then became evident that it was impossible to attack directly the fire which was entrenched in this broken ground. An investigation was then made of the workings immediately below the seat of the fire to see if it would be possible to construct a series of water tight dams. The pillars below the fire section were found to be thin and crushed, and the workings were too much fallen to be entered. It therefore became apparent that the only resource left was the flooding of the mine as quickly as possible. The barrier between Dominion No. 1 and the Reserve was then travelled and sounded, and it was agreed that the barrier pillar was strong enough to resist the pressure of water required to fill Dominion No. 1. However, the points believed to be the weakest were strengthened by bracing, etc. On the 28th of March the smoke coming from the shaft was seen to increase suddenly. An examination was made and it was found that the fire was within 200 feet of the pit bottom. The men were at once ordered out of the mine and it was decided to close the mine down, seal it and flood it by making an opening through some old workings out on the beach

in the crop coal. This was done, a distance of 100 feet having been driven by the aid of machines through the crop in four days. While it required only 16 days continued flooding to cover the seat of the fire, the dilatory methods adopted by the Company consumed 47 days. There was apparently no reason for this dilatoriness, and it might have been attended with serious consequences. On May 10th the temperature of the shaft and the absence of smoke encouraged an examination of the mine. After the mine had been opened and aired for a few hours, the exploring party went in and were met by smoke. It was apparent that enough water had not been put in. The representatives of the Department fearing the strength of the barriers, ordered the men out of the main Reserve deep, and insisted that the water should be allowed to run in continuously until the fire section was completely submerged.

On May 23rd a fresh exploration was made and the bottom of the shaft was reached by the travelling road, and it was apparent that the fire was out. As soon as the mine was cooled off and put in order, men were set at work putting in pumps and cleaning up. Finally 20 pumps were put in use unwatering the mine and displacing the water which was put in, and calculated to amount to 580 million gallons. The work of reopening is slow and tedious owing to falls, and the immense amount of ground to be traversed to the faces.

The fire and the operations connected with it did not result in a loss of life. Eleven horses were suffocated the morning the fire broke out. An investigation was held into the origin of this fire, at which the Inspector of Mines and his Deputies were present. All the men who were near the origin of the fire or connected with the charge of the pit at the time, were examined. Nothing was elicited that threw any light on it. The cross-cut had a wooden brattice in it, and several coal tubs which had been broken up in an accident had been thrown in there. It is supposed that some miner walking up the deep in some accidental manner lighted it.

The cross-cuts on main deeps and levels should be of brick or other permanent material, and they should not be allowed to contain any inflammable material.

I append some statistical information, analyses, etc., which may be of interest,

And remain, yours truly,  
NEIL A. NICHOLSON,  
*Deputy Inspector.*

AVERAGE NUMBER OF CUBIC FEET OF AIR PER MINUTE CIRCULATING  
THROUGH CAPE BRETON MINES YEAR ENDING SEPT. 30TH, 1903.

Dominion No. 1.....	100,000
N. S. S. & C. Co. No. 1.....	100,000
"    "    "    No. 2.....	37,000
"    "    "    No. 3.....	20,200
Broad Cove, No. 1 .....	40,000
"    "    No. 2.....	4,000
Mabou, No. 2.....	8,800
"    "    No. 3.....	5,724
Port Hood.....	28,000
New Campbelton .....	7,750
Sydney Coal Co.....	4,000

## COAL ANALYSES OF NOVA SCOTIA STEEL &amp; COAL COMPANY, LIMITED.

	SYDNEY No. 1.	SYDNEY No. 2.	SYDNEY No. 3.
Moisture .....	1.46	2.10	1.46
Vol. Com. Matter .....	38.38	36.50	38.38
Fixed Carbon .....	55.65	56.15	55.65
Ash .....	3.27	5.25	3.27
Sulphur .....	1.23	3.26	1.23

## COKE ANALYSIS NOVA SCOTIA STEEL &amp; COAL COMPANY, LIMITED.

Coke yield .....	62.6
Gas contents vol. mat. ....	34.3
Water .....	3.1

## COAL ANALYSIS OF PORT HOOD COAL COMPANY, LIMITED.

Fixed Carbon.....	56.00
Vol. com. matter .....	33.00
Water.....	2.00
Ash .....	6.00
Sulphur .....	3.00

## COAL ANALYSIS OF INVERNESS RAILWAY &amp; COAL COMPANY, LIMITED.

Carbon.....	65.00
Sulphur.....	4.00
Water.....	9.00
Ash and refuse .....	3.00
Vol. com. matter .....	19.00

## Accidents in Cape Breton Mines During Year Ended September 30th, 1903.

DATE.	MINE.	NAME.	AGE.	OCCUPATION.	REMARKS.
1902.					
Oct. 3.	Port Hood.....	John L. Morrison.....		Deputy.....	Slightly injured while riding on wood tram going down slope.
" 14.	".....	Allan H. McEachern.....		Laborer.....	Slightly injured by being jammed between full boxes on level road.
" 10.	N. S. S. & C. Co.	James Price, married.....	30	Miner.....	Shot went off, striking him on back of head.
" 6.	Port Hood.....	Neil McLean.....		Leg broken, struck with empty box on landing.	
Dec. 12.	N. S. S. & C. Co.	William Snow, single .....		Chain Runner	Foot caught in conveyor scrapers.
1903.				Laborer. ....	
Jan. 22.	" " "	Robt. Watson, married.....	29	Miner.....	Leg broken by fall of coal.
" 29.	" " "	William Hamilton, married.	30	" .....	Killed by runaway trip on slope.
Feb. 9.	" " "	Alex. McKinnon, single.....	13	Tally boy.....	Injured, cage being raised to high slides came out striking him on head.
Mar. 12.	" " "	Daniel McPhee single.....	18	Driver.....	Shoulder injured by horse falling on him.
" 27.	" " "	Jacob Gondrike.....		Miner.....	Injured by shot going off while re-lighting squib.
April 22.	" " "	James Forrest, single.....	31	" .....	Leg broken by fall of coal.
June 20.	" " "	Cass McLennan, married....	30	" .....	Leg broken by fall of stone.
" 4.	" " "	John Roberts, married....	30	" .....	Injured; lighting squib and shot went off.
" 10.	" " "	Wilkie Stewart, single.....	14	Tally boy.....	Killed; jammed between tub and tipple at pit head.
July 28.	" " "	Edw. McMullin, single.....	22	Miner.....	Slightly injured by fall of coal.

" 15.	" "	Thomas Bailie, single.....	17	Driver.....	Arm broken by slipping on rail.
Sept. 11.	" "	Ignatation Corkey, single.....	21	Laborer.....	Legs badly cut by falling over donkey rope.
Jan. 2.	Port Hood.....	Robert J. Bell.....	.....	.....	Arm taken off; caught in belt wheel of
Feb. 19.	" "	Percy White.....	.....	.....	Electrical Engine.
" 21.	" "	John Merritt.....	.....	M. Engr.....	Leg broken by horse falling on him.
Jan. 13.	" "	Edward Watts.....	.....	Driver.....	Killed while riding on trip, coupling broke
April 16.	Mabou .....	J. J. Cameron.....	.....	Chain Runner	hurling boxes against roof.
Jan. 6.	Dominion No. 1.	Charles D. Marshall, single	19	Shift man.....	Leg broken; struck by cage.
1902.	" "	Angelo Moncusco, married.	60	Laborer .....	Fatally injured ; caught by box on slope.
Dec. 6.	" "	Arch Morrison, single.....	24	" .....	Arm broken ; jammed between full tubs.
" 29.	" "	Hugh Elliott, single.....	23	Miner.....	Killed by full tub on main haulage road.
" 26.	" "	George Traynor, single.....	15	Driver .....	Seriously injured by runaway tub on main haulage road.
					Fatally injured by fall of coal at room face.
					Leg broken by fall of full tub.

E. GILPIN, JR., Esq.,

*Deputy Commissioner and Inspector of Mines, Halifax, N. S.*

SIR,—I beg to submit to you a report on the coal mines in the Glace Bay and Port Morien Districts, Cape Breton County, for the year ended September 30th, 1903:

GOWRIE AND BLOCKHOUSE COLLIERIES.

Development has been continued at this colliery. The levels have been extended 2,000 feet since the last report. Owing to there being some question as to the thickness of the strata underlying Port Morien the levels were turned to the left and driven through part of the Dominion Coal Company's lease on such a course that when they re-enter the property of the company there will probably be ample cover for mining operations. An endless rope haulage has been placed in these deeps, and improvements made in the drainage and ventilation. About 600 additional horse power has been added to the boiler plant, a temporary Rand compressor has been installed machinery for the underground haulage, etc., a wash-house has been erected, and there will also be a suitable bankhead. Fifteen visits were made by Mr. Neville and myself during the year.

The average amount of air circulating through this colliery is 30,000 cubic feet per minute.

CALEDONIA.

All the principal levels, etc., have been considerably advanced in this colliery. Pillars are being drawn to the rise of the west levels on No. 1 and 2 west landings, and on No. 2 east landing in new slope. On No. 1, 4 and 5 west landing, and on No. 3 east landing, west deep, No. 2 and No. 6, west landing in east deep, these pillars are being successfully drawn, and a very small percentage of coal lost.

A new brick boiler house has been erected on the surface. This colliery was visited 14 times during the year.

The average amount of air circulating through this colliery is 92,000 cubic feet per minute.

DOMINION NO. 3.

The slopes at this colliery are 3,960 feet long. The distance from slope mouth to bankhead is 5,000 feet. During the past year the main slopes were driven 950 feet and levels turned away. The rooms from the levels have been worked to the rise in each section and the

pillars drawn back. Bottom levels have been driven through to the Caledonia workings, a distance of 1,200 feet, to allow the water of this mine to drain into the Caledonia.

Two concrete dams four feet thick, lined on each side with 12 x 12 inch hard pine, are inserted in the pillar three feet on each side, and in the bottom and roof 2 feet. In the lower dams there two pipes to pass the drainage. Hose connections have been made at intervals of 400 feet from the top to the bottom of the 8 inch air pipe. An engine on the surface connects with this pipe, and is ready to supply water in case of fire.

The average amount of air passing through this colliery is 45,000 cubic feet per minute. This mine was visited 14 times during the year.

#### DOMINION No. 2, PHALEN SEAM.

The bottom main shaft has been sunk 60 feet below the coal and storage tanks and revolving tipplers put in. Three deeps were broken off the levels 1,500 feet north of the shaft. They have been driven 1,300 feet and rooms turned away north and south. Similar progress has been made on the south side.

The average amount of air circulating through this mine is 175,000 cubic feet per minute.

#### HARBOR SEAM.

The headways on the south side of the shaft were driven 1,584 feet to the barrier between the Sterling and Harbor seam pits. It is intended to pump out the Sterling pit and continue the headway. Other extensions have been made with a view to bringing the workings in this seam into full operation.

The amount of air passing through this mine is 78,000 cubic feet per minute.

*Haulage.*—In the Dominion No. 2, Phalen and Harbor Seams, four tail rope engines, having cylinders 8 inches by 10 inches, have been placed in position to haul out of the deeps in these seams. Six high pressure air locomotives have been introduced and necessary pipes and stations laid for charging. The compressor on surface shows a pressure of 950 lbs., and the locomotives carry a pressure of about 850 lbs. in the mine. Four of these locomotives weigh 17 tons each; the others about 9 tons.

*Pumps.*—Two large Northeby pumps, having steam cylinders 20 inches by 24 inches and water cylinders 8 inches by 20 inches, are being placed in the Phalen seam. Water pipes are being laid in the main entrances to the mine, with hose connections every 500 feet, to

furnish sprinkling water and for fire protection. The main air pipes are also connected with the pump, and once a week the roads and working places are thoroughly sprinkled. A new shaft is being sunk about 250 feet north of the present fan shaft and is now 180 feet deep. This shaft, when completed, will be 11 x 37 feet inside, and will be used as an air shaft and to lower and raise both men and material. On the surface the equipment is approaching completion. A number of dwelling houses have been built, a hotel, etc. This mine was visited 23 times during the past year.

#### HUB COLLIERY.

On the first day of February, 1903, a start was made to take the water out of this mine, and on the 10th of July the bottom of the shaft was reached. Pumping has since been continued to the deep, and it is expected that about the 1st of March the mine will be ready for regular operations. The pit when unwatered, was found to be in good condition. It is intended that this mine shall be worked entirely by coal cutting machinery, and installations are in progress for that purpose. The bankhead has been repaired and put in good condition, and they have the necessary machinery for working the mine on a large and continuous scale.

#### INTERNATIONAL COLLIERY.

The deeps on No. 11 landing have been extended 400 feet to the barrier, 300 feet thick, separating this colliery from No. 2. Workings have been extended in other directions, and it is anticipated that when the shaft now being sunk at Dominion No 2 is completed and the water from this mine handled at that point, there will be a large section of the pillars to draw.

Pillars are now being drawn on No. 1 and No. 2 levels. An electric light and telephone system above and below ground has been put in. The average amount of air passing through this mine was 64,000 cubic feet per minute. The mine was visited 14 times during the year.

#### RESERVE COLLIERY.

##### FRENCH SLOPE.

The deeps and levels have been extended during the year. Pillars have been successfully drawn on No. 4 north level, leaving very little coal. The main pump has been connected with the main air pipe, and hose connections put in, so that water can be pumped to any part of the workings.

##### EAST SLOPE.

In this slope the deeps have been advanced 1,000 feet and four levels turned off north and south. The pillars have all been taken out to the rise of No. 1 south level, and No. 2 except those

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necessary to support the marsh land. An air shaft has been sunk on the south side of the slope near the crop to serve as an intake instead of the haulage road.

#### MAIN SLOPE.

The main deeps are now at the barrier separating this working from Dominion No. 1. Pillars have been drawn on No. 9 and 10 landings. No. 11 Section, which filled with water during the fire, has been pumped out and is now working. Improvements have been made in the pumping arrangements. The amount of air circulating through this mine averages 270,000 cubic feet per minute.

An electric light plant and telephone system has been installed. Improvements have been made to the boiler plant, etc.

In conclusion I may say that the mines in this district are in good condition, and the management at the different collieries gives every attention to safeguarding life and property. As a rule the requirements of the Coal Mines Regulation Act are well carried out. It has been agreed between the Deputy Inspectors representing the Department of Mines, and the Dominion Coal Company, that in future the barriers of the underground workings between the different mines be not less than 200 feet in thickness, and that a travelling road or air-way 12 feet wide, be left on each side of each barrier, and be kept in good condition. Pillars not less than 60 feet in length to be left next these air-ways. The rooms as they approach the barriers, to be narrowed to 12 feet and be driven for the last 20 feet at this width, leaving the pillars 28 feet wide at this point. Pillars, not less than 100 feet in thickness, are to be left in future between the deeps. Pillars not less than 50 feet thick are to be left at the bottom of each lift below the levels.

During the year considerable prospecting has been done south of Cochrane's Lake by the Cape Breton Coal, Iron and Railway Co. The Moseley seam was traced for about two miles east and west of the Moseley pit. The coal was found to be 5 feet 10 inches thick near the crop, increasing slightly to the dip. The seam is lying at an inclination of about 1 in 10, having a sandstone and shale roof. Preparations are being made for opening this seam, a line of railway having been surveyed to Louisburg Harbor, land cleared and machinery ordered, etc.

I beg to remain,  
Yours truly,

JOHN CADEGAN.

## Accidents in Cape Breton Coal Mines, Southern District, during year ended Sept. 30th, 1903.

No.	DATE.	MINE.	NAME.	AGE.	OCCUPATION.	REMARKS.
	1902.					
1	Oct. 6.	Reserve . . . . .	John Hines . . . . .	38	Miner . . . . .	
2	"	" . . . . .	Daniel McIntosh . . . . .	30	" . . . . .	Slightly burned by two cans of powder being accidentally ignited.
3	"	" . . . . .	Thos. Arthur . . . . .	28	" . . . . .	do
4	"	" . . . . .	Patrick Hogan . . . . .	26	Loader . . . . .	do
5	"	" . . . . .	John Hogan . . . . .	23	" . . . . .	Badly do
6	Oct. 9.	Caledonia . . . . .	Alex. Morrison . . . . .	24	Miner . . . . .	Killed by fall of coal from pillar.
7	Oct. 22.	Dom. No. 2 . . . . .	Sylvan Laundry . . . . .	21	Loader . . . . .	Leg broken ; caught between coal box and props.
8	Oct. 29.	Reserve . . . . .	John McLeod . . . . .	29	Miner . . . . .	Killed by fall of coal from pillar.
9	Oct. 30.	International . . . . .	Silvester Fortune . . . . .	14	Trapper . . . . .	Arm broken ; fell off empty coal box.
10	"	Dom. No. 2 . . . . .	Fred. Way . . . . .	21	Driver . . . . .	caught between box and prop.
11	Nov. 21.	" . . . . .	John McKimmon . . . . .	20	Can Tender . . . . .	Foot crushed under car on surface.
12	Dec. 5.	" . . . . .	Angus Morrison . . . . .	22	Helper . . . . .	Leg broken by fall of stone from roof.
13	Dec. 13.	Dom. No. 3 . . . . .	Michael Bodrat . . . . .	25	Loader . . . . .	do
14	Dec. 15.	" . . . . .	Fred. Lanswood . . . . .	19	Laborer . . . . .	Killed on slope ; run over by full boxes.
15	Dec. 30.	Dom. No. 2 . . . . .	Peter McDougall . . . . .	22	Loader . . . . .	Seriously injured across back by fall of coal.
	1903.					
16	Jan. 13.	Dom. No. 3 . . . . .	Jos. Quann . . . . .	39	Landing Tender . . . . .	Killed ; caught between loaded box & pillar.
17	Jan. 17.	Dom. No. 2 . . . . .	Angus Stewart . . . . .	22	Car Tender . . . . .	Foot crushed under coal car on surface.
18	Feb. 4.	" . . . . .	John J. Smith . . . . .	26	Roadman . . . . .	Leg broken by fall of stone from roof.
19	Feb. 18.	Caledonia . . . . .	Jos. Parsons . . . . .	19	Landing Tender . . . . .	Collar bone broken ; caught between box and pillar.

20	Feb. 21.	"	Alex Pass.....	40	Miner.....	Burned on face & hands by gas in headway.
21	Feb. 26.	Dominion No. 2.	Emile Keehn.....	38	Timberman.....	Fatally injured; run over by loaded box.
22	Mar. 5.	International....	Marshal Leonard.....	14	Trapper.....	Leg and arm broken; run over by empty trip.
23	Mar. 12.	Dominion No. 2.	Harry Rosefield.....	22	Loader.....	Three ribs broken by fall of coal from face.
24	Apr. 8.	Reserve.....	Matthew Stubbert.....	42	Miner.....	Killed by miss shot; exploding while examining it.
25	Apr. 13.	Dominion No. 2.	John A. McNeil.....	14	Trapper.....	Killed; run over by a loaded box.
26	Apr. 17.	Dominion No. 3.	Robert Croft.....	28	Miner.....	Fractured ankle by fall of roof stone.
27	Apr. 18.	International....	Frank Campbell.....	27	" .....	Seriously injured by piece stone from roof.
28	Apr. 24.	Reserve.....	Michael McNeil.....	28	Miner.....	Killed by explosion of gas in No. 5 South level, French slope.
29	"	"	Henry Jackson.....	24	Helper .....	do
30	"	"	Joseph King.....	25	Loader .....	do
31	"	"	William King.....	23	Driver .....	do
32	"	"	William Whiteway.....	25	Loader .....	do
32	May 2.	Dominion No 3.	Walter Lear.....	20	Landing tender.....	Seriously burned, died on the 27th.
34	May 8.	Caledonia.....	William McKay.....	24	Shot firer.....	Leg fractured by fall of loose coal.
35	May 14.	International....	John McNeil.....	27	Laborer .....	Two ribs broken, caught between boxes.
36	June 12.	Caledonia.....	John Ryan.....	60	Shiftman .....	Jawbone broken by piece of stone from roof.
37	June 20.	Dominion No. 2.	John M. Blue.....	25	Loader .....	Killed; caught under descending cage.
38	June 26.	Reserve .....	Daniel J. McNeil.....	31	Shot firer.....	Leg broken by piece of coal from face.
29	July 9.	Dominion No. 3.	Anthony Mugford.....	44	Landing tender.....	Injured across hips; caught between box and pillar.
40	July 18.	Dominion No. 2.	Frank Baird.....	22	Driver.....	Injured across back; caught between box and boom.
41	July 29.	"	"	50	勞工.....	Leg broken; jammed between box and door.
42	Aug. 4.	Reserve .....	Andrew Antle.....	24	Loader .....	Leg broken by piece of coal from face.
43	Aug. 18.	Caledonia .....	Peter Boutilier.....	60	Miner.....	Arm broken by piece of roof coal.

*Accidents in Cape Breton Coal Mines, Southern District, During Year Ended September 30th, 1903, (Continued)*

No.	DATE.	MINE.	NAME.	AGE.	OCCUPATION.	REMARKS.
44	Aug. 25.	Caledonia.....	Albert Bontilier .....	30	" .....	Jaw broken; struck by a runaway box.
45	Sept. 3.	Dominion No. 2.	Iauchlin McDonald..	29	Sinker.....	Killed by hoisting bucket falling on him.
46	"	"	Elijah Bennett.....	33	" .....	Fatally injured; died one hour after.
47	"	"	James Bradbury.....	47	" .....	Leg broken; struck by falling bucket.
48	Sept. 22.	"	George Butcher.....	24	Loader .....	Leg broken by piece of coal from face.
49	Sept. 23.	"	Hector McDonald....	28	Brakeman .....	Leg broken; caught between air locomotive and prop
50	Sept. 26.	"	John A. Rickets.....	50	Shot firer.....	Killed by fall of coal.

## GOLD.

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The production during the year 1903 amounted to 25,198 ounces compared with 28,279 ounces during the year 1902.

It is hoped that the investigations of Mr. Faribault, of the Canadian Geological Survey, and the deductions therefrom set forth in his report to the Government of Nova Scotia on deep gold mining in this province, will prove a guide to developments that will greatly augment the production of our gold field.

I append the report of Mr. Weatherbe's visits to the mines in operation during the year.

## REPORT ON THE GOLD MINES OF THE PROVINCE.

FROM SEPTEMBER, 1902, TO SEPTEMBER, 1903.

To DR. E. GILPIN,

*Deputy Commissioner and Inspector of Mines,*

SIR,—In presenting the attached report on the annual inspection of the gold mines, I submit the following notes for your consideration :

EXPLOSIVES.

Of recent years many accidents of a serious nature and often with fatal results have occurred in our mines through the use, or as it might aptly be said through the misuse, of dynamite. Several of the worst of these have been due either to the improper construction and care of thawing houses, or to the methods used in thawing.

A significant fact in connection with the above is that, in many instances, the victims have been men above the average in intelligence, and used for long years to the handling of this treacherous explosive.

During the past season I saw a case at a mine where a quantity of dynamite was being thawed on top of a barrel within a few feet of a hot boiler, and close to the maulhole and hoistway of the shaft.

Again, while employed underground in one of our largest mines, at four separate times during a fortnight, I found loose pieces of dynamite cartridges lying in unused stopes and levels. This was probably due to carelessness of the loaders.

At some of the, otherwise, best equipped mines in the province the thawing houses are poorly constructed, have unsafe or inadequate means of thawing, are too close to the shaft and other mine buildings and are often literally soaked inside with nitro-glycerine

Many rules have been laid down for dynamite, which hold good in every case except one in perhaps a thousand, but there is always the possibility of this thousandth chance upsetting all calculations. Men who spent their lives about dynamite have been killed by its apparently inexplicable action. It has been found by experiment that dynamite freezes at fortyfive degrees and explodes at 360 degrees Fahren-

heit. It is supposed to be absolutely harmless when frozen. But these rules have some notable exceptions. Dynamite has been known to explode when apparently frozen, and with terrible results. It can only be supposed that some part of it was not frozen or that frozen dynamite has some mysterious properties not yet understood.

Under ordinary conditions dynamite will burn as readily as sugar. It gives off a reddish flame when ignited. At other times a flame will explode it; no one understands exactly why. The same mystery surrounds the effect of concussion. Even a violent jarring will not explode dynamite once in a hundred times. Tons of it have gone through railroad collisions without exploding, when the car carrying it had been completely demolished.

Cartridges have been dropped from the roofs of ten story buildings or have been hammered like putty without result. Then again, a slight shock has set off cartridges which had been packed with the greatest care.

It is popularly supposed that, because dynamite explodes at a temperature of about 360 degrees F. when heated at a moderate rate, it may be burned with impunity; but it is forgotten that when burning, the mixture becomes heated above its exploding temperature in a short time, and may explode with violence.

The following extracts from the Manual, issued by the Ontario Bureau of Mines, may be read with interest, and if the recommendations are followed, their publication may be of some service:—

"It would seem almost unnecessary to warn intelligent beings against the perils of warming dynamite over an open fire, of carrying it in their boot-legs, of throwing pieces of dynamite cartridges into out-of-the-way corners of a mine where they may afterwards be discovered with painful results; nor would it seem needful to point out the terrible disaster that may follow from biting a cap on to a fuse. But these and equally reckless practices are of daily occurrence at mines and on railroads, entailing risk of life not only to those who themselves are guilty of such criminal carelessness, but, what is worse, to innocent parties."

#### NITRO-GLYCERINE.

Nitro-glycerine is a nitric ether, or specifically a glyceryl tri-nitrate. Different degrees of nitration yield the mono-, di-, and tri-nitro-glycerine, respectively, the latter being the nitro-glycerine of commerce, having the chemical formula  $C_3H_5O_8(NO_2)_3$ . It is made by treating an exceedingly pure quality of glycerine with a mixture of nitric and sulphuric acids, the proportions commonly adopted

being 3 parts of nitric acid, 5 parts of sulphuric acid, and from 1 to 1.15 parts of glycerine. The glycerine is added very slowly, and with constant stirring. The agitation of the mixture is now usually accomplished by compressed air.

Properties of nitro-glycerine. When made from the purest ingredients nitro-glycerine is an oily-looking fluid, as clear and transparent as water. When freshly made it is whitish and opaque, but on standing it clears. As usually made it has a yellowish tint, but the best makers at the present day turn out a nearly water-white product. The specific gravity of nitro-glycerine at ordinary temperatures is 1.6 which increases when frozen to 1.735, showing that it contracts 10-21 of its volume in freezing.

Nitroglycerine dissolves in alcohol, ether, methyl alcohol, benzine, etc., but is nearly insoluble in water (about .003 per cent.) Freshly made opaque nitroglycerine freezes at from 2.2° to 7.6° F. while the transparent or "cleared" product freezes at from 39.2° F. to 37.4° F. In a frozen state nitroglycerine is less sensitive to shock or concussion than when liquid, but on breaking frozen crystals a peculiar molecular change occurs from which explosions result. It may be completely evaporated at a temperature of 158° F., and dynamite will lose 10 per cent. of its nitroglycerine if exposed for several days to a temperature of 104° F. It is claimed to slowly volatilize at normal temperatures above its freezing point. Its ignition temperature, or more properly, firing point, is 350° F. Exposed to a temperature of 365° it boils with the evolution of vapors. At 381 2° F. it volatilizes slowly. At 392° it evaporates rapidly. At 422.6° F. it detonates violently. From this point its behavior changes, passing through temperatures at which it explodes with constantly lessening violence, until at a dark cherry red heat, it merely assumes the spheroidal state and fails to explode. This is true for small quantities only. When gradually heated it is certain to explode at 356° F. If other nitrous compounds are present, due to faulty glycerine or faulty washing, nitroglycerine will explode at lower temperatures.

Nitroglycerine is rapidly decomposed, by yellow ammonium sulphide, and other alkaline sulphides, with the separation of sulphur. It is slowly decomposed by an alcoholic solution of potassium hydrate, by ammonia, carbonate of soda, (sal soda) and other alkaline carbonates, by hydrogen-sodium phosphate, hot water, ferrous chloride, and sulphuric acid. All acids cause its decomposition, and traces of acids remaining in it from its manufacture lead to deterioration; hence the importance of an absolutely acid-free nitroglycerine. Any acidity may be detected by litmus paper (turning blue litmus paper red.) For its safe decomposition by inexperienced persons a strong solution in water of sodium carbonate (sal soda) is best. The decomposition is slow and unattended by danger. Gentle stirring with a wooden paddle will facilitate the reaction.

The action of the direct rays of sunlight is known to cause the decomposition of nitroglycerine, and may provoke an explosion. When decomposition sets in, it usually, but not always, proceeds in a tranquil manner, disengaging nitrous fumes which color the nitroglycerine green, then developing nitrogen and carbon dioxide (carbonic acid) and crystals of oxalic acid, water, and ammonia. But decomposition is not always so quietly accomplished, especially if the temperature is high, as when heated by the sun. It is not to be trusted. If treated to a temperature of 212° F. for a few hours it decomposes. In small quantities nitroglycerine will burn quietly, but with large quantities the heat thus generated will bring the entire mass to the explosion temperature before it has burned away. The critical temperature for nitroglycerine lies between 113 degs. F. and 122 degs. F., and its sensitiveness is greatest just above the freezing point.

Pure nitroglycerine is not sensitive to friction or moderate percussion, except where pinched between metallic surfaces. A quantity of it has been thrown up by means of a rocket to a height of 1,000 feet, from which it fell without being exploded by the impact. When impure or in a state of decomposition, however, it is exceedingly sensitive and explodes violently on shock, even when unconfined. The best nitroglycerine, when confined, is liable to explosion by shock.

Nitroglycerine taken internally, except in minute medicinal doses, behaves as an active poison.

#### DYNAMITE.

Dynamite is the most largely used of any blasting material in the world. It was invented in 1866 by Alfred Nobel. The principle consisted in using an absorbent, commonly called a "dope", which would take up the nitro-glycerine and hold it somewhat after the manner of a sponge. A suitable dope should possess a cellular structure, so that the nitro-glycerine may be sub-divided into minute globules, each globule held separately, in its own cell, completely isolated from every other. In this condition its sensitiveness is greatly reduced, depending, of course, upon the amount of nitro-glycerine absorbed. Dynamites may be classed according to the nature of the absorbent used.

The original dynamite of Nobel consisted of nitro-glycerine absorbed in kieselguhr, or diatomaceous earth. This material consists of the siliceous remains of microscopic cells and capillary tubes, within which, when the nitro-glycerine is once absorbed, it is tenaciously held. The nitro-glycerine is thus cushioned against the effects of sudden shocks, and will normally explode only under the powerful impulse of a detonator. The kieselguhr is cleansed and calcined with great c

and will then take up 75 per cent. of nitroglycerine. According as the percentage of nitroglycerine is reduced the dynamite becomes less sensitive, and at 40 per cent., it requires a powerful detonator to insure explosion. Magnesium carbonate, though a valuable absorbent, will not hold the nitroglycerine as effectively as kieselguhr. It is used to some extent as a mixture in other dopes. Kieselguhr dynamite is the typical dynamite, but it is not made in America, since other less expensive dopes are available, which under proper conditions afford an almost equal degree of security.

Wood pulps vary considerably in the amount of nitroglycerine they will absorb, ranging from about 60 per cent. to 85 per cent. Before introducing the nitroglycerine it should be thoroughly dried, on no account being allowed to retain more than 1 per cent. of moisture. Nothing is more certain to cause deterioration of dynamite, with "leaking" of the nitroglycerine, than moisture, and dynamite so deteriorated is exceedingly dangerous and should not be used.

There are certain requirements which all dynamites should fulfill, and it is the duty of all persons using or handling them to see that they do not fall short of the proper standard. Good dynamite should not feel greasy. There should be no trace of free nitroglycerine inside the wrapper of the cartridge. In order to test this point lay one of the suspected cartridges on a sheet of clean brown paper in a room at from 60 to 80 deg. F. for a period of about 12 hours. If the cartridge has begun to "leak" nitroglycerine, this will be shown by an oily discoloration on the brown paper. Dynamite properly made should be proof against leakiness under normal conditions of temperature and moisture. To test its quality in this respect two separate determinations should be made. First, freeze and thaw samples of the dynamite three successive times, and test for leakiness as explained above. Second, expose samples to a temperature between 85 and 90 deg. F. for six consecutive days and nights, and again test for leakiness. In neither case should any trace of free nitroglycerine be seen on the brown paper. If slowly heated dynamite explodes at 356 deg. F., and if rapidly heated it explodes at 446 deg. F. These temperatures apply only to kieselguhr dynamite. The American dynamites containing woodpulp and nitrates will explode at somewhat lower temperatures. Like nitro-glycerine, it is most sensitive to shock or friction just above its freezing point.

According to the character of dope used, it freezes at from 42 degs. F. to 46 degs. F. It is nearly if not quite insensitive to shock when frozen, but not entirely so to friction. Cartridges broken while frozen are liable to explosion from molecular disturbance of the nitroglycerine crystals. Ramming frozen sticks into a hole is attended with the same danger. Explosion of frozen dynamite may be due to long crystals of nitroglycerine with films of unfrozen nitro-

glycerine, exploded by friction. Frozen dynamite is not incapable of being detonated, especially if very powerful detonators be used. Any efflorescence, whitish film, or incrustation on dynamite cartridges indicates either that the dynamite itself contained an excess of moisture in the dope, or (what is most likely to be the cause) that it has been subjected to excess of dampness in transportation or storage. In either case the incrustation is due to the dissolving out of the nitrate of soda or potash from the dynamite. This has consequently destroyed its homogeneity, and such dynamite is almost always leaky, or will soon become so. It is unreliable, may fail to explode in blasting, and will produce noxious fumes if it does explode. Its power as an explosive has been reduced also, so that it possesses the disadvantages of being dangerous to handle, unreliable as a blasting agent, and at best uneconomical. It should not be used, but should be destroyed. Exposure to the rays of the sun, especially if transmitted through window glass, is liable to produce decomposition and explosion. A strong electric discharge or a flash of lightning will usually explode dynamite. Dynamite placed in water gradually parts with its nitroglycerine, its place in the cartridge being taken by the water.

Attention is specially drawn to this fact because of the popular impression that dynamite is unaffected by water, an error that has probably arisen from the fact that it can be used in wet holes or under water. In wet situations it should be fired within a reasonable time after preparing the charge, and under no circumstances allowed to remain unexploded for a period of many hours; otherwise nitroglycerine will leak out and find its way into crevices, where it may cause accidents later on. The characteristics given above apply to all those explosives known popularly as dynamite, giant powder, dualin, atlas powder, hercules powder, rendrock, etc.

#### STORAGE.

Local conditions have much to do with the type of structure to be built for an explosives magazine. In general it may be said, the lighter the construction the better. Thus the radius of danger is reduced to a minimum. The only points in favor of more solid construction are safety from fire and from burglars. In America this precaution is of little moment, so that in open country, where a sufficient zone can be obtained free from inflammable materials, the light construction is preferable.

Storage in caves, tunnels, earth or stone covered vaults and in log structures should under no circumstances be tolerated. The chief objection in all these cases is that the structure will hold dampness, and any dampness in a magazine containing any explosive into which nitrates enter as an essential or accessory ingredient is certain to

affect its quality and render it more or less dangerous in subsequent use. This applies to gunpowder, (common black powder) and to practically all dynamites, especially those made in America.

A suitable building is one made of common weather-boarding on a framework of 2 by 4 inch stuff, with a tight flooring of tongued and grooved boards, blind nailed, and with walls and ceiling sealed with the same material. The roof should be of tarred paper. Where danger of fire is apprehended the lightest steel shingles may be used on the roof and outer walls. The door should be heavy and should in all cases open outwards. Openings for ventilation should be provided around the bottom, protected by wire screens or otherwise against the entrance of vermin, and so constructed that water cannot enter.

Considerable difference of opinion has existed regarding the danger from lightning. The Swiss Committee on the physical properties of dynamite (1870) reported that "thunder storms and lightning involve no special danger to dynamite. But if well confined, and if the temperature produced by the lightning be high enough, an explosion may possibly take place." Prof. Munroe severely criticises neglect of lightning protection, and suggests that "a network of metal rods carried over the tops of those magazines whose roofs are slated, and given a sufficient ground connection, would be a complete protection."

Greater safety may be obtained by either so placing a magazine that a hill or rise of ground is interposed between it and adjoining objects that may suffer from an explosion. If this is not possible a mound of earth or sand from 12 to 15 feet high, with its base 20 feet from the magazine, will deflect the force of the explosion upwards and will materially shorten the radius of danger in that direction.

Dynamite should be stored in tiers, box on box, with battens or lath between the successive layers of boxes to insure good ventilation and to lessen the danger from friction.

Gunpowder in unopened cases, dynamite in unopened boxes, and fuse securely boxed, may be stored together in the same magazine, but no fulminates in the form of caps or otherwise, or loose coils of fuse should be stored in the same building with gunpowder and high explosives.

The building must be kept scrupulously clean, and men with nails exposed on the soles or heels of their boots should not enter or work in any magazine. No fire should be permitted in or about such a structure, and smoking is not to be tolerated in the vicinity of explosives.

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It is advised by those having most experience in the storage of explosives that gunpowder kegs should be rolled over once every two or three weeks to prevent caking, and that cases of dynamite should be turned over once every two weeks.

According to Mr. G. G. Turner, one of the most experienced men in practical blasting operations in America, this is an economy, because it tends to keep the dynamite homogeneous in composition, so that it detonates better. This is not necessary while the dynamite remains frozen.

No keg of gunpowder or box containing any other explosive should ever be opened in the magazine. This may be allowed only in small buildings kept for this purpose, where a limited supply for immediate use is maintained. In such a building not over 200 pounds of any form of explosive should be kept at a time.

In the case of dynamites it is best to unpack the total quantity at once, wipe off the sawdust, lay the cartridges on their sides upon planed board shelves, and then carefully remove all fragments of the original boxes and sawdust, which should be burned in the open. Such sawdust usually contains more or less nitroglycerine, unless the dynamite is in unusually perfect condition. Any oily stain on the cases indicates that nitroglycerine had leaked from the cartridges. The shelves must also be frequently inspected, and if any oily stain is observed, no matter how minute, it must be thoroughly washed with a saturated solution in water of ordinary carbonate of soda (sal soda, or "washing soda"). This destroys the nitoglycerine. The floor of this building should also be washed occasionally with such a solution. No fire of any kind should ever be permitted in this structure, but it may be warmed by steam pipes, provided they are so placed that no explosive may ever come into direct contact with them.

The taking of unopened boxes of dynamite into a mine is a most reprehensible practice, since proper cleanliness and the removal of the sawdust and fragments of the boxes is not as easy as it is from buildings above ground. Only dynamite cartridges from which the sawdust has been wiped and placed in clean boxes should be sent below.

It is always advisable on receiving a fresh consignment of such explosives to make an inspection to ascertain that it is in good order. The opening of one box or keg out of every ten will usually suffice to detect any serious deficiency. If not in good condition the manufacturers should be notified at once. If faulty, it should then not be returned (for its shipment under such circumstances, especially in the case of nitroglycerine powders, is dangerous) but should be destroyed. For this purpose select a sufficiently isolated situation

and lay the dynamite cartridges on the ground end to end in a line or very open spiral. Pour parafine oil over the entire train, or if this is not available, use kerosene, and ignite one end of the train with an ordinary fuse (of course not using a cap). It will burn quietly and safely.

Fuse in open coils should be stored separate from all other explosives, as should also caps, detonators or exploders. They should be kept in a dry place, where there is freedom from fire or high temperatures.

#### THAWING DYNAMITE.

Dynamite should not be thawed by direct heat from a fire or a stove. There is also more or less peril of producing leakiness and starting decomposition by thawing it in the sun. There is peculiar peril from thawing it in the sun when the rays are transmitted through window glass as imperfections in the glass are apt to focus the heat at certain points.

There are only two safe ways of thawing dynamite, viz.: in a room heated by steam pipes, in which case the explosive must never be laid on the pipes, and in a vessel surrounded by warm water. The proper temperature of the water is 125 deg. F., which is approximately the temperature at which the bare hand can just be held without pain. The water should be heated separately and poured into the water-space in the thawer, and the thawer should not be heated over a stove or other source of heat. The best material to use in making a thawer is sheet zinc, though the best grades of galvanized iron will do. All seams should be absolutely smooth, so as to leave no crevices for the lodgment of dirt and nitroglycerine.

In using any form of thawer the cartridges should be free from sawdust, and the vessel or tubes holding them should be kept scrupulously clean. The only way to make sure of maintaining a proper freedom from accumulations of nitroglycerine in the thawer is to wash it out after each thawing with a strong solution of carbonate of soda (sal soda or washing soda) which is best applied warm.

Dynamite is never properly thawed while it feels lumpy at any part of the cartridge. It should be uniformly pliable throughout. Its use when but partially thawed is attended with danger in loading, and its detonation will be imperfect, with the consequent disadvantages of yielding a less powerful effect and giving off noxious fumes.

#### HOISTING.

Though happily fewer serious accidents have occurred through negligence in this branch of the work than in the actual extraction

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of mineral, it is probably due to the ropes, drums, wheels, cages, and tubs, etc., being easily looked after, and to the fact that few of our deeper shafts are vertical, the strain thus being reduced by the friction of the rails or slides.

A few suggestions, however, may not be out of place : Special attention should be paid to a new rope for the first few weeks, as during that time wires are apt to break, through change in position or inefficiency. Ropes should not be used when several wires are broken in the same place. They should be constantly oiled or dressed to prevent rust, and should be examined systematically. A very good preparation for dressing steel ropes is made by mixing one barrel of coal tar or pitch tar with one bushel of slack lime and boiling well. The rope can then be passed through a trough containing this mixture. The pulley wheel should be of large diameter and should generally be blocked or in any case not worn rough. Care should be taken in "aligning" the pulley wheel and drum to prevent extra friction and wear of rope.

In Queensland the Act provides that every rope or chain before being used must be equal to carrying not less than  $1\frac{1}{2}$  times the weight of the ordinary load, including cage, loaded truck or car and weight of rope from shaft bottom to pulley wheel.

The selection of a rope and the relation of its diameter to the diameter of pulley wheel is a more important matter than is usually considered, not only with regard to safety, but as affects economy.

The best crucible cast steel rope with six strands containing nineteen wires in each, and with a hemp centre, is an excellent rope for hoisting.

An efficient test for a steel rope is performed in the following manner: Take a wire, say four inches long; place it in the vice, and bend it to a right angle so as to give more surface bearing to hold it firmly during the test; make one leg one inch long, and the other three inches long. Now fix the angle of the bend and the short leg very firmly in the end of the vice; then take a pair of tongs and apply them to the projecting piece, which is three inches long leaving  $2\frac{1}{2}$  inches clear for twisting between the end of the anvil and the tongs. Note the number of revolutions the wire will twist before breaking, treat each wire alike, especially as regards the  $2\frac{1}{2}$  inches to be tested.

#### PLANS.

Attention was drawn in my last annual report to the necessity for having plans and information regarding the underground workings recorded in the Mines Department. On the attempt being made to enforce the statute in this respect, a ready acquiescence was shown by the various managers to fall in with the scheme, and during the

year plans of some twenty mines were filed in this office. An example was given in the same report of a case where plans of the underground workings would, if kept, have saved expense. Since then a more startling case has occurred in which the largest producing mine in the province was totally lost by caving, and no official record of the extent of its workings has been preserved. This is in one of the most important districts, and new developments which are expected to be on a large scale have been commenced immediately below these old openings.

It is true that a number of the plans returned were crude, and in some cases they probably contained inaccuracies; but the fact of obtaining and recording *any* information of value in this line is a step in the right direction.

It is surprising, however, what meagre particulars are kept by the Companies themselves, even at the largest mines.

At very little extra expense, information might be daily placed in the Companies' offices which would, in many cases, give an accurate key to the most economical methods in future development work, and place in the hands of the investor or student an absolutely true and graphic history of the mine.

A very simple suggestion, which, if necessary, could easily be elaborated upon by notes, etc., is as follows:—

Let the foreman carefully measure the thickness of the ore deposit, or the portion of it milled, at say every five feet gained in the levels, shafts, winzes and raises, as well as in the stopes. These figures could be placed regularly on the large working plan in *blue*. The values of the ore—taken from the regular mill run—could be put on the same plan and at the same points in another color, say *red*. Very often it would be found that the pay shoots follow regular and parallel zones, and that the values conform to certain thicknesses or characters of ore. Without this information these facts are imperfectly known, or in fact not recognized at all.

I would again respectfully suggest the enacting of some more definite regulations regarding the use, handling and storage of explosives.

#### ISAAC'S HARBOR.

#### DOLLIVER MOUNTAIN MINING AND MILLING COMPANY.

G. J. Partington, Manager; G. E. Francklyn, assistant, and Daniel McA skill, foreman. About 90 men are employed.

Last autumn a series of accidents to the dams, sluices and water wheel necessitated repairs. These have been completed during the year, and the necessary horse power has been transmitted electrically to the shaft-house and engine room. In the latter an electric hoist, a 130 H. P. motor and half a "15 drill" Rand Compressor supply the power direct for hoisting, pumping and drilling. Four machine drills and two air pumps are used. In the shaft house, which has also been completed during the past year, a 60 H. P. motor runs the large size Gates rock breaker, and with its surplus power will supply a machine shop to be erected just north of the shaft house.

At present, cylindrical steel tubs are used for hoisting, and are tipped by an ingenious device consisting of hook and rope specially arranged. When a depth of 500 feet has been reached, a tipping cage, to be built by I. Matheson & Co., will replace the tubs.

The shaft house is connected with the mill by a trolley way some 1,200 feet long and sloping up to the mill. Unfortunately, this track could not be arranged with a down grade to the mill, owing to quicksand, and the necessity for a good tailing dump preventing its being placed otherwise.

The building has been completed with foundations for 80 stamps. Forty stamps are already in place, and have been crushing since June.

Four Wilfley concentrating tables are in position below the plates.

Automatic ore feeders of the Challenge pattern are used, and commodious ore bins provide for a supply being kept on hand.

Most of the milling machinery is made by the Allis-Chalmers Co. The power in the mill is supplied by two motors, one of 85 H. P. for the stamps and feeders and a smaller machine for the concentrators.

A 50 H. P. motor in a separate power house outside the mill building runs the endless cable-way for the ore trucks from shaft to mill.

The magazine is situated some distance from all buildings and is lighted and warmed by two banks of incandescent lamps. A lightning arrester is placed outside to provide against accident.

#### UNDERGROUND DEVELOPMENT.

The vertical shaft measuring 17 feet 6 inches by about 5 feet inside timbers had reached a depth of 265 feet.

A station was cut on the "Partington" belt and rails laid at 159 feet from the deck. This station measures 12 feet by 22 feet 9 inches,

and a pillar 25 feet thick has been left round the shaft, which was sunk exactly on the anticlinal axis. The plane of this axis is, however, pitching south, and the shaft eventually will intersect the north "legs" of the successive veins.

Levels from this station have been carried back on the legs of the belt 200 feet on the south leg, and 150 feet on the north side of the anticlinal.

An air shaft has been sunk for 60 feet on the south leg and is situated 450 feet west of the main shaft. Connection will be made shortly with this from the level now driving. The belt contains between 5 feet and 6 feet of milling stuff at the faces, and the plan is to take out the ore over the dome for 100 feet from the shaft and to leave the "crown" in place, from there westerly, as a support. It will be necessary to support the above excavation with heavy timbering.

In the meantime the shaft which is now 265 feet deep, has gone through the 22 foot belt, and has just tapped the "Forge" belt on which, when a station has been cut, levels will be driven back on the legs in each case, as on the Partington Belt, and a cross cut will be made north and south to cut the legs of the two overlying belts for second lift on each.

A regular system of pillars is to be left throughout the workings.

#### THE BOSTON-RICHARDSON MINING CO.

C. W. Donohoe, Manager; John Thornham, underground foreman, and 40 men employed.

This Company took over the property from the Richardson Company in May of the present year, negotiations having been carried on between them for some months.

In March the workings were completely lost by an extensive crush which demolished the main east shaft. This was caused by the tremendous swinging weight of the practically unsupported roof closing in on the foot wall. Fortunately the men, at the time of the accident, were in the lower workings, and partially protected by the pillars in those levels, which the Department, during recent years, have insisted on being left. They therefore had a means of exit up the steep north shaft, which, though remaining nearly intact at that time, is now probably in a somewhat similar, though modified position to that in which the main east shaft was, immediately before the accident.

In June I explored these workings so far as the water would permit, and found their passage extremely precarious. The fractures

extended round to the north leg, and one of the lower pillars on the west side of the north shaft I noticed to be badly cracked underneath.

There can be no doubt that the cave-in and consequent loss of money, and employment to a large number of families was directly due to negligence for a period covering a number of years.

Even though the necessary pillars were not left in the mine, it is possible that the main shaft might have been saved if, after the severe crush on the south leg in 1900, the precautions had been taken, as directed, of placing continuous and heavy false pillar work along the south side of the shaft and square set timbering under the roof.

The new management are enlarging and sinking the vertical shaft commenced by the Richardson Company. This is to be 19 feet by 6 feet and will be divided into three compartments, two for cages and the third for pumps and ladderway.

This shaft is situated 850 feet from the old shaft house and about 60 feet southerly from the line of the old shaft. It is expected that the vein will be tapped at a vertical depth of about 450 feet, and at not a great distance below the old workings.

The old shaft house and other buildings have been removed and what is considered the danger area on the surface over the workings, where several signs of caving are manifested, has been fenced.

There is some talk of replacing the mill with a new one.

#### COCHRANE HILL.

*J. B. Neily.*—Geo. F. McNaughton is opening up the old Cochrane Hill Gold Mining Company's property for J. B. Neily, to whom it was transferred.

#### WINE HARBOR;

*Plough Lead Mining Co.*—M. McGrath, Manager; C. N. Robar, Foreman. Twenty-three men employed.

No changes have been made during the year on the surface or in the plant. The east shaft is now 215 feet deep. The ore shoot has been followed some 86 feet east of this shaft, and the ore is taken out by the underhand method, hand steel being employed in the operation. The deposit continues on its pitch to the east and its dip to the south. A pillar 10 feet by 20 feet is left at a distance of 20 feet east of the shaft and at a depth of about 180 feet from surface.

*Old Provincial Mining Co.*—S. R. Heakes, Manager; Geo. Hirschfield Foreman. The shaft sunk for the Plough Lead has been

deepened to 350 feet. At the west end of the 300 feet level, so-called, (which is really 284 feet from deck,) and 50 feet from the shaft, the cross-cut north was discontinued at 65 feet, and another tunnel was carried south 80 feet. Neither of these, however, intersected the belt.

At the bottom a cross-cut south struck what is supposed to be the continuation of the "Plough Belt" at 21 feet from shaft, and drifts are being carried on it east and west. These are now about 50 feet each way from the cross-cut. About 21 inches of quartz is showing in the faces on this drift.

The cross-cut was also driven about 27 feet north of the shaft. At the bottom of these works a Cornish 6 inch pump with 3 foot stroke lifts to the 300 feet level where a Northey 4 x 6 x 7 handles the water to the surface.

At the "Caledonia" works the shaft is now 210 feet deep and a level has been driven on the belt which is 8 feet wide and is said to contain 7 feet of crushing material. The level is now 50 feet west of the shaft and 80 feet east, where it is connected with the old incline by a short cross-cut south. This work was effected by driving back from this incline and raising to meet the shaft.

At 20 feet east of the shaft a cross-cut has been driven from this level 20 feet south and 30 feet north. As the shaft is now considerably below all old workings the plan is to sink and after gaining a lift below the present bottom-level to remove the ore in sight by the underhand method.

The shaft is being enlarged to 18 feet by 8 feet. Two Northey pumps are used, one 4x6x7 and the other  $4\frac{1}{2} \times 2\frac{3}{4} \times 4$ .

*Plant.*—In the engine house a 100 H. P. boiler supplies steam for a 100 H. P. generator. This runs a 20 H. P. motor, two electric drills, Sturtevant fan, and lights at the Plough Lead works. The boiler also supplies an Ingersoll Compressor running two drills at the Caledonia works, a feedwater pump and heater, and the 15 stamps and Wilfley concentrator in the mill building.

*The Napier Property.*—Exploitation on this property during the year, under the direction of L. W. Getchell, has proceeded and about 230 oz. of gold have been produced, from these test crushings.

#### GOLDENVILLE.

*Bluenose Gold Mining Co.*—About 50 men are employed at this progressive mine, under the management of Arthur G. McNaughton. Stephen Monk still retains his position as foreman, underground.

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The plant has been augmented by a new boiler, but otherwise remains the same.

Five Sullivan drills are employed on both shifts.

Development during the year comprises the following work :—The main shaft on the Springfield belt has been deepened by an additional 105 feet, making a total depth from sill of 470 feet, and another cross-cut (No. 3) has been carried from here across the measures, northerly to the McNaughton belt. The main shaft is to be deepened for a sump, and a bin is to be put in at the cross-cut level. A small pump is installed in this new sinking. A level has been driven on this belt at the face of cross-cut, 70 feet west and 13 feet east, and connection made with the next level above. A small block of ore was removed at the bottom of this winze on the west side.

The 360 foot level has been extended 130 feet west and 120 feet east, giving a total length of 738 feet.

The ore has been taken out from the west face in a series of back stopes up to the 270 feet level, at a distance from its west face of 100 feet.

East of the cross-cut the 360 feet level is now in 300 feet, and the ore has been stopeed from a point within 30 feet of its face up to the next level. A 30 feet raise has been driven at the face.

The 280 feet level has been driven westerly for an additional 60 feet. It is now 278 feet west of the cross-cut.

The belt is said to supply about 36 inches of "crushing," and in places the quartz in this amounts to about 24 inches.

*Wentworth Workings.* The same company are opening up these old workings. The shaft on the Wentworth Belt has been remodelled and is 100 feet deep. The ore has been taken out above the west bottom level for a height of 30 feet and to a distance of 100 feet from the shaft. A cross-cut here follows a break southwesterly for 35 feet where the belt is again encountered and some old workings connect with a shaft a short distance from the cross-cut. On the east side the ore was worked out by former operators to the surface by underhand stoping from a point near the shaft bottom. The main lead in this belt measures from 14 inches to 20 inches.

The present plan is to sink and drive east under the old workings to catch a rich roll supposed to crop to the eastward, and pitching westerly. This roll is on a vein in the south side of the belt. A

cross-cut from the shaft bottom connects with the Warren lead over 100 feet to the north, and a raise was made to an old shaft on this lead situated close to the road.

*Palmerston Belt.* In the report on this district in the last annual Mines Report will be found a note referring to the intention of Mr. Geo. W. Stuart to sink a shaft to exploit the ground to the west of area 743. During the season the following work in this connection has been accomplished: A shaft  $14\frac{1}{2}$  feet by  $4\frac{1}{2}$  feet has been sunk for 120 feet and is still in process of sinking. This is close timbered. But below this depth setts are to be put in every five feet and boarded. The shaft is divided into three compartments: a skip-way, tub-way for sinking and baling, and a ladder and pump compartment.

When 160 feet has been reached the intention is to cross-cut south and drift on other belts as well as on the Palmerston Belt. A 7 inch lead, well mineralized, shows in the present shaft-bottom.

(Since the above examination was made, it is reported that the cross-cut mentioned has been driven and a large belt of rich quartz struck.)

A commodious shaft-house, engine and boiler-room is built, all contained under one roof over the shaft.

A well planned deck head, with ore and rock shoots and bins, is also contained in the building. A tank in the wall of shaft at 55 feet is emptied by a Cornish pump.

The remaining plant consists of two 60 horse power boilers, one 50 horse power double drum hoist, and a 60 horse power engine, which will supply power for the Blake rock-breaker, pump, and dynamo yet to be installed.

A large duplex Rand compressor of a new design was being placed in position at the time of my visit.

John Lawson is underground manager here, and has 17 men employed in three 8 hour shifts.

#### ROYAL OAK MINING Co.

On the Jumbo lead the shaft has been sunk an additional 120 feet, making it 320 feet deep, measured on the dip. A drift has been made 30 feet west at the bottom, and from it a cross-cut was driven north to the Hayden lead.

The 200 foot level was extended east 58 feet, and at the face of the old part of this level a cross-cut connected with the Hayden Lead.

In the 100 foot level a cross-cut connects with the Hayden, and two small blocks of ore have been removed below the level, and a block between the 100 foot level and the 40 foot level has been removed on the west side.

On the Hayden Lead the work has been confined to a depth below the level of the old works.

The shaft has been sunk from 130 feet to 200 feet. This level has been driven 190 feet west, and 90 feet east, and on the west side stoping has been extended from the face up to the old workings,

Near the east face of this level a small block of ore was removed and a raise carried up to some stoping, from which place connection is had by a cross-cut to the Jumbo lead. Below the west 200 ft. level a block has been taken out, measuring 20 feet in depth by about 50 feet in length, and connection was made by sinking and raising with the cross-cut from the 320 ft. level, on the Jumbo lead.

Work is still being prosecuted in a prospecting manner by the aid of "whims" on the "McKenzie" and another belt to the north.

Ten stamps have been added to the mill.

A new 80 H. P. boiler has also been installed, and the old boiler in the mill building has been removed to the "Jumbo" lead shaft-house.

A Rand air compressor for 7 drills (steam chamber 10x12 and air chamber 12x16 L. P.) has also been placed at the shaft.

Four Rand machines and a Sullivan drill are used in both shifts (10 hours each.)

Gardner McKenzie is still in charge with J. McGrath as assistant. There are 25 men on surface and in the mine.

W. J. McIntosh is general manager.

ECUM SECUM.

G. H. Gillespie, Manager.

C. Drillio, foreman, and 13 men employed.

The work during the year consisted in sinking the vertical shaft, 44 feet below the cross-cut, (giving it a total depth of 165 feet from surface,) and driving a level on the Galena belt at the cross-cut level, or

120 feet from the surface. This level was driven 270 feet east of the cross-cut and 310 feet west, and raises were commenced for stoping, on each side. A cross-cut near the east face was driven north to the "Incline" belt, 24 feet.

The "Galena" vein varies in thickness from 2 inches to 5 inches in quartz.

At 75 feet from the surface in the incline a drift is in west, 100 feet on the "Incline" belt, and the drift on this belt at the cross-cut level is in east, 280 feet.

The workable shoot on this "Incline" belt contains about 2 feet 6 inches of quartz, with some slate, also said to be milling.

The shaft is still in process of sinking.

The plant in the new engine room, now completed, includes a 100 horse power Matheson tubular boiler, a double drum "Flory" Hoist, and a Rand air compressor (12x18) capable of running 8 drills.

#### HARRIGAN COVE.

*Kent Archibald's Property.*—Munro Archibald, manager; J. A. Fraser, foreman; 17 men employed.

In the old workings north of the mill little work has been done. A prospecting cross-cut is being driven south from face of the west level.

In the new work commenced last year the west shaft is now 70 feet deep, and the other shaft, 83 feet to the east, is 110 feet from surface.

The method of removing the ore is by underhand stoping. A block west of west shaft is out for distance of 80 feet. The new vein has also been stoped from the bottom of the east shaft to a point in the west shaft 50 feet from the surface.

On the east side of the east shaft stoping has been carried from the bottom to a height of 50 feet, and at a distance of 50 feet from the shaft.

A small boiler and engine runs a Cornish pump, situated in the west shaft to which point the water is lifted from the lowest workings by an injector. A new boiler is being put in place to run this pump, and a steam drill.

Hoisting is effected from the east shaft by a "whim." The 5 stamp mill is running double shift.

*The St. Anthony Mining Co.*—J. F. O'Leary, manager; F. Horn, assistant manager, and 12 men.

The management are at present engaged in pumping out the old works which were allowed to partly fill with water. In the meantime several large leads are being opened near the anticlinal to the north, and some tests from these are being run through the mill.

*Messrs. Boak & Oland.*—These operators are opening a vertical pit on the apex of the anticlinal, and are also sinking several small shafts on the north dip close by.

#### TANGIER.

*The Tangier Amalgamated Mining Co.*—At the time of my visit the property was being pumped out, operations having been temporarily suspended pending negotiations with a new company.

Work during the year was principally confined to the Kent shaft which is 170 feet deep. A level was driven west 80 feet, and cut through a shoot of good ore which was intersected by the shaft in sinking and pitching west. The shaft is to be sunk another 100 feet when another level will be driven west to catch this shoot and possibly an underlying one.

Arch McPhail is still in charge of the work.

#### MOOSELAND.

*The Arlington Mining & Milling Co.*—R. McG. Fraser, Manager; Nath. Higgins, Foreman, with 4 men employed.

Work is being commenced on the "Cummings" belt. The shaft is 130 feet deep and will be sunk another 20 feet when drifts will be broken out on the lead. In the upper portion of the shaft there are two veins, but the belt at the bottom contains the "Cummings" lead only, about 5 inches in thickness. The same plant as mentioned in the last report on this mine is in use.

#### CARIBOU.

*Baltimore and Nova Scotia Mining Co.* L. W. Getchell, General Manager; Otto Collings, Assistant; J. S. Fleming, Underground Foreman; Fred Darragh, Surface Foreman. Sixty-two men employed.

During the past year development work has progressed extensively. A resumé of this work shows the following additions:—

No. 3, or the 700 feet level has been driven easterly another 40 feet, and is now 400 feet west of the cross-cut from the shaft. At this west face a raise has been made and a hoist installed and a winze sunk about 115 feet. The milling belt measures in this winze some 22 feet in width. Drifting has been started in both directions at the bottom of the winze, and will be pushed east at once to make connection by cross-cut, and raise, with the shaft at the 800-ft. level.

A large block of stoping has been done above this west 700-ft. level. This measures some 300 feet in length and from 60 feet to 120 feet in height.

At about 40 feet from the face of the same level, a cross tunnel is being driven to cut another belt some 700 feet to the southward. This cross-cut is now about 150 feet from the level. Near the west face of the 500-ft. level a cross-cut is being started north. A wooden tram road is in course of construction to carry fuel and mine timber from the Company's timber grants. When completed a light locomotive will be run on this.

No change of importance has been made in the plant.

#### WAVERLEY.

*Waverley Gold Mining Co.* At the time of inspection this mine had been closed down for several weeks on account of insufficiency of water power. There is some talk of installing a water power at Fall River with wire transmission for an electric plant.

During the year connection has been made with the "Temple" property, which has been worked under the same management. The vertical shaft on this property has been extended down on the vein from the bottom of the vertical portion and the levels successively joined with the older workings.

#### RENFREW.

*Pictou Development Co.*—H. McDonald, foreman, and 25 men employed.

This property has been bonded to J. Morrison under an agreement to transfer.

The workings now present the following appearance:

The main shaft, though not sunk on the true dip of the strata is vertical for 75 feet, and the remaining portion lies in the belt containing the "Jubilee" quartz. It is now 350 feet deep.

Levels were driven at the following depths and for the distances shown, all in a south-easterly direction and on the vein:

No. 1	at a depth of	140	feet for	75	feet.
No. 2	"	180	"	"	"
No. 3	"	250	"	"	"

At 75 feet from the shaft a cross "break" throws the strata on the east side of the fault south-westerly for a distance of about 25 feet. The plane of this fault pitches to the southeast and is parallel to the course of the shaft. At 300 feet in the shaft a short level is driven on the belt, and the ore is stoped up to the fault.

Cross-cuts are driven across from levels Nos. 1 and 2, on the fault.

The cross-cut from the No. 1 level is in 100 feet, at which point another vein was intersected and driven on for 30 feet. At 26 feet in this cross-cut, the original belt is driven on for 50 feet at which point another fault throws it back northerly 8 feet. A drift is in on the vein from here 30 feet. From where the cross-cut from the 180 ft. level reaches the vein across the break, the belt has been drifted on for 30 feet, and a small raise has been made from its face. The lead on the east side of the fault is very small. A new plant has been added at the "Jubilee" shaft.

Some 300 feet south of these works, a shaft 90 feet deep, is being sunk on a lead measuring in places about 12 inches. This shaft is 90 feet deep and when 100 feet has been reached levels will be driven.

This work is in charge of J. D. Horn.

Another shaft, now 40 feet deep, is being sunk on a lead near the road, to the north-east.

#### OLDHAM.

*New England Gold Mining Co.*—L. E. Daloz, manager, and four men.

These operators have opened up some old workings on the Columbia property in order to test their values.

Two shafts were cleaned out to a depth of about 100 feet. These shafts are about 60 feet apart. In the old works stoping had been carried to a distance of about 60 feet east of the east shaft, and from the bottom of the west shaft to the surface by breastwork.

A cross-cut between the shafts at the bottom level is driven north for 410 feet, and has cut several leads including the "Wallace," "North Wallace," "Dowell" "Worrell" and several others.

A 50 H. P. boiler and engine is in use.

*Old Stirling Property.*—John Forster and others are operating this property. E. Whidden is manager and 10 men are employed.

The boiler and engine house was burned on the 12th of August, necessitating a temporary stoppage of operations.

These workings are situated on the east turn of the anticlinal and two slopes or inclines starting from the same shaft house are driven down on the belt at about  $35^{\circ}$ .

Two slopes have been sunk from the same deck head.

The most southerly of these is 250 feet deep and at the bottom is 120 feet from the northerly slope which is 430 feet deep.

At 112 feet from surface in the north slope a cross-cut is driven east to meet a vertical shaft situated 264 feet from the mouth of the slope. This shaft is 120 feet deep. From 370 feet in this slope the ore was removed up to the bottom of the south slope. No stoping was done along the north side of the north slope as a fault occurred there. This, however, appears to be thinning out and the intention is to drive north on the belt.

#### LEIPSIGATE.

*Mic-Mac Mining Co.* T. W. Moore, Manager; W. A. Bryson, Foreman. Twenty-seven men in mine, and twenty-two on surface.

Since last season the workings have been extended as follows:

The shaft is now 370 feet deep. The 200-feet level has been extended to distances of 418 feet northeast and 360 feet southwest, but no work has been done above this level.

The 300-feet level is in 260 feet southwest and 281 feet northeast.

Blocks of stoping have been done between the 200-foot and 300-foot levels. These have been carried 200 feet on the northeast side of the shaft and 150 feet on the southwest side.

A new shaft-house has been built and contains a newly installed plant, including a 100 horse power Mumford boiler, a 50 horse power "Mundy" hoist, and an 8-drill Ingersoll compressor.

Work has recently been stopped underground to enable a new skip-way to be placed in the shaft. This was nearly finished, and a Northey pump (10x6x12) 5-inch suction and 4-inch discharge, has also being installed.

A trestle and tramway connects the shaft house and mill building, which has been enlarged and now contains a cyanide plant which has been running with apparent success since last February.

New foundations have been placed under the mortars. This plant includes four treatment vats (16x5) for tailings sand, and 2 settling

tanks for slimes. The slimes are not treated at present, but the intention is to elaborate the plant so that their values may be extracted later.

The procedure is practically similar to that recorded before in the Mines Report : (See Caribou, 1901, and Isaac's Harbor, 1902.) The strong solution (.25 per cent.) is allowed to cover the sands about 3 inches, and after leaching, is strengthened gradually, until it comes out at the stopcocks the same strength as going in.

The sands are then washed and the total time of leaching from when the strong solution flows into the tank until the clean water comes out in the launders is about 30 hours.

These tanks hold nearly 50 tons, and one is filled and one emptied each day. At present "stock" is being taken from the old tailing beds as well as from the plate discharge.

H. S. Badger is in charge of this part of the work. Some tests were made recently by C. D. Maze as to the applicability of the Bromo-Cyanide process.

For particulars as to the operation of the above plant see the end of the gold report.

#### NORTH BROOKFIELD.

*The Brookfield Gold Mining Co.*—W. L. Libbey, General Manager  
Stanley Cole, Manager. From 60 to 65 men employed on double shift

All the work during the year since September, 1902, has been confined to the area below No. 9 level, and in detail, is shown as follows :

No. 10	level	is in	510	feet	from incline,
No. 11	"	"	452	"	"
No. 12	"	"	300	"	"
No. 13	"	"	80	"	"

Above levels Nos. 10, 11, and 12 the stoping has been extended out to the faces of the level in each case. A small block has been removed above level No. 13.

The face of the sinking is now 1,758 feet from the deck, or at a vertical depth of about 975 feet from surface.

From a number of measurements taken at intervals in the stopes and in the faces of the four lower levels the slate belt containing this quartz deposit, and including the "gouge" seam, generally accompanying it, and which I was informed, comprised all the milling material, averaged in thickness 21 inches.

The same plant as last season is in use. Recently experiments were made by C. D. Maze with the Bromo Cyanide process, but with what practical success I am not aware.

The manager informed me that the question of installing a cyanide plant was now under consideration.

#### MOUNT UNIACKE.

*Westlake Property.*—J. A. Crease is still in charge of the work with D. Patriquin as assistant. Eleven men are employed.

A new shaft-house has been built over the east shaft in which practically all the development during the past season has been done.

This work has consisted in following the rich "roll" to a distance of about 120 feet on its pitch east of the shaft. The angle of this pitch is from  $18^{\circ}$  to  $20^{\circ}$ .

Exploration has shown that this "roll" is probably caused by a disturbance in the form of a shattering or distortion of the strata, the crop of which strikes obliquely across the measures in a north-west and south-east direction, and pitching to the eastward more steeply as the disturbed zone is followed northward. To support this view, the case of similar "rolls" in the Westlake and Nuggety leads to the south may be taken as examples. In the Westlake the farthest south of the three veins, the "roll" occurred near the surface and lay almost flat along its pitch. In the Nuggety it was supposed to be slightly steeper, and in the present workings on the Borden lead it pitches, as stated above, at an angle of about  $19^{\circ}$ , and its upper end commenced at a depth of about 60 or 70 feet from the surface.

Following this theory, the management are driving at a depth of 120 feet in this east shaft to cut a vein lying about 20 feet to the northward, and in which they hope to find a similar roll to that now being worked so remuneratively.

In the western end of the mine near the west shaft a vein about 6 inches in thickness was followed into the wall and seemed to lie flat for several feet. It would appear that this might be indicative of an overlying and similar shoot of ore.

The question of these enlargements in the veins is a most interesting and important one to this part of the district, and will certainly repay thorough investigation.

*J. A. Johnson's property.*—These workings are situated on the Nuggety vein, and George E. Johnson is in charge of operations, with four men under his direction.

The old "Queen" shaft which was last year 160 feet in depth, has been deepened to 175 feet and sinking is still in progress.

At 250 feet a cross-cut will be driven north to the Borden lead. The "Nuggety" vein in this belt measures from 2 inches to  $4\frac{1}{2}$  inches, and near the bottom of the shaft another small vein  $1\frac{1}{2}$  inches in size, occurs in the centre of the belt. Work was commenced here about the middle of last August.

#### SOUTH UNIACKE.

*The Victoria Mining Co.*—John Kenty, manager; Daniel McEachern, foreman, and 32 men.

Work was commenced on the old "Withrow" property in June, 1902; but little of consequence was accomplished until March, 1903.

Since then the shaft on the "Slate" lead belt, 35 inches wide, has been deepened from 300 feet to 400 feet, and levels driven at this latter depth 130 feet east, and 113 feet west. Above this level three "lifts" have been taken out on each side by the overhand method. These stopes measure about 12 feet each in height. The extent of the old workings is approximately as follows:—

The 300 feet level is 444 feet east of shaft, and 380 feet west. The 200 feet level is 400 east and 150 west, and at 100 feet a level connects with a shaft 118 to the west. From this shaft a level is driven west 300 feet and the ground stoped above this to the shaft at a point 40 feet from surface. On the west side of the shaft the ground is out from the face of the 300 foot level to the face of the 200 foot level, and from there to the 100 foot level between the main shaft and the west shaft mentioned above.

On the east side the ore is all out between the 300 foot level and the surface.

The belt contains two leads, one 5 inches, on the hanging wall, and another, in the centre of the belt, about  $1\frac{1}{2}$  inches in thickness.

Three pumps are installed in the pit. An extra large Northey Compound Duplex 8x12 inch steam cylinder,  $4\frac{1}{2}$  inch plunger, and 12 inch stroke is stationed at the 300 feet level, in the hanging wall. This lifts from dams on each side of the 300 feet level. Just above this pump another Northey in the shaft is used alternatively. This is  $7\frac{1}{2}$  inches by  $4\frac{1}{2}$  inches, and 10 inches stroke.

A smaller Northey pump lifts from the bottom to the dam. A new shaft-house and mill building combined has just been completed. The mill contains a 20 ton ore bin, and iron ore floor with rock and ore chutes, a Blake pattern rock breaker, challenge feed, and 10 stamps, and the mill engine.

A separate building contains two boilers and the hoist.

#### CYANIDE AND GOLD REDUCTION AT THE MIC-MAO MINING CO., LEIPSIGATE.

The following notes and figures will, no doubt, prove interesting, as the apparent success of the work at this mine may be duplicated at many other localities.

The facts were kindly furnished me by Mr. H. S. Badger, who is in charge of the milling plant at this mine.

*The Ore.*—The gangue of the ore is a calcareous quartz, containing slate and “gouge.”

It carries per ton :—

Gold.....	\$10 58
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Concentrates :—

Sulphides of Iron, Copper, Lead and Zinc.

By amalgamation it is found that the best recovery that can be got on the average was about \$7.08 per ton.

By assay the ore contained \$10.58 per ton.

It was therefore decided, after experiment, to put in a cyanide plant. This was completed in February, 1903, at a cost of \$5,000.00. The plant has a capacity of about 50 tons per 24 hours, and operations were commenced on February 22nd.

The idea is to eventually treat the tailings from the mill plates alone; but in the meantime the old beds are also being treated. Difficulties are met here as the “sharps” and “slimes” often lie in separate layers, and mixed in places with organic matter, etc., which retards lixiviation.

Altogether 5,104 tons of stock valued at \$3.78 per ton, or a total value of \$18,295.00 were treated, and an extraction made of 74.9 per cent. equalling as shown by the mint returns \$2.83 per ton.

The total cost of producing this is \$1.05 per ton, divided as follows:

Labor for charging tanks.....	\$0 26
" discharging tanks.....	09
Technical staff, including management.....	34
Cost of chemicals, per ton.....	33
Time for precipitation.....	03
 Total cost per ton.....	 \$1 05

It must be borne in mind, as stated above, that about half the stock treated was from the old beds, thus considerably raising the cost of treatment as well as lowering the percentage of extraction. Again, the mill tailings contain about 50 per cent. of slime, worth about \$2.25 per ton, or say \$1.15 per ton of ore. At present the recovery from these is very limited, but as soon as possible arrangements will be made to separate these properly and treat them to advantage.

The average value of the bullion produced by the cyanide process at this mine is \$16.26 per ounce, composed of:—

Gold.....	792.90 parts.
Silver.....	126.60 "
Base metals :	
Zinc,	
Lead,	
Copper, }.....	81.10 "
	 1000.00

### COPPER.

#### THE COLONIAL COPPER Co.

This company commenced work at their property in May, 1900, and the following description of what they have accomplished is from an examination on August 20, 1903

*Area and Position.*—This company's property is situated on the Peninsula of Cape D'Or, in Cumberland Co., and comprises three blocks of five square miles under license to search, and one lease of one square mile. The water front covered by them extends from Spencer Island to Horseshoe Cove.

*Workings.*—Three mines have been opened, the "Hanway lode," "No. 1" and "Bennet's Brook." Of these the first was the only one accessible at the time of my visit, and so far as can be ascertained it is considered the most important of the three.

*"Hanway Lode."*—The deposit which is being worked consists of a belt of brecciated trap, containing in places boulders, and measuring from 35 to 60 feet in width. This belt contains in places, (the extent of which were hard to determine, from the limited nature of the workings,) masses of native copper. I saw pieces as large as 100 square inches or more in sizes and varying in thickness from  $\frac{1}{4}$  inch down to the thickness of writing paper. At other points small nodules of metallic copper occurred, though in comparison with the extent of the deposit so far as worked, these "pockets" or rich "zones" were exceedingly small. It is assumed therefore that dependence is placed on the main belt, in which occassionally could be seen small shot-like particles of native copper. In order to venture an adequate opinion of the value of the belt it would be necessary to sample carefully and regularly across its width, at various points, and test by assay, or to be more accurate still it would be better to run systematic mill tests of the ore. The company volunteered no opinion of the value of the ore, and therefore no direct estimate of this can be made.

On this deposit two inclines have been sunk, one to the south varying in dip from 50 degrees to 30 degrees, and extending for 670 feet, and one to the north at 25 to 30 degrees, and some 500 feet in length. These have been connected by two levels and several drifts, cross-cuts and winzes have been made. The belt dips slightly to the west, and its east wall is distinctly defined by a vein of calc spar, averaging about ten inches in thickness. The south incline underlies the water at high tide, and the pit water at the bottom is salt. The workings, however are not to be prosecuted in this direction. The country rock outside and enclosing the belt is composed of a very hard trap rock.

#### BENNET BROOK MINE.

The following descriptions of both the "Bennet Brook Mine" and "No. 1" were given me by the management:

*"Bennet Brook Mine."*—A shaft has been sunk in a deep ravine and near the water level for a depth of 180 feet, and several cross-cuts and drifts have been made from 20 feet to 100 feet in length. I understand the water became too heavy to handle here.

*"No. 1 Mine."*—The shaft here is 371 feet in depth and two drifts, running south-east and west have been driven 450 feet and 460 feet respectively. From the end of the west drift an incline has been driven on a belt for 150 feet at 30 degrees.

#### PLANT.

*"Hanway Lode."*—4 hoists, 1/2 Rand compressor, 3 drills, 1 receiver 6 drills (inactive), 1 150 horse power boiler, 1 75 horse power boiler 1 Smith & Vale pump, 1 Northey pump.

---

*"Bennet Brook Mine."*—1, 50 horse power boiler, 1, 20 horse power boiler, 1 steam pump. The drills are run by air from Hanway Lode (900 feet of supply pipe and receiver.)

*"No. 1 Mine."*—1 duplex Rand compressor, 12x18; 1, large Matheson boiler; 1, Florry hoist; 1, receiver; 1, small Armstrong engine and fan; 1, cage.

*Mill Contains.*—Grizzly, Blake pattern, rockbreaker, 2 sets rolls, screens and elevators, 3 jigs, 1 Ostermoor concentrator, 1 85 horse power boiler and a Jenckes 75 horse power Corliss engine.

The pumping station has 2 Northeby duplex pumps and a boiler and is situated at Horse Shoe Cove.

A railway  $1\frac{1}{8}$  miles long connects mines and mills and the rolling stock comprises 1 locomotive and cars.

N. B.—A reference to this mine, as well as to the operations of the Cumberland Copper Co. at Wentworth, will be found in Mr. Cameron's report page 13.

## IRON.

### ARISAIG IRON DEPOSITS.

These beds are situated on Upper Doctor's Brook and its branches, in Antigonish County. It is about  $1\frac{1}{2}$  miles by road from Malignant Cove.

I examined the beds along their strike for about a mile, but am told their crops have been opened for a much longer distance each way. The apparent general strike of the strata is about N.  $70^{\circ}$  E., and the beds appear to dip northerly at a steep angle.

*Campbell's Bank.*—Six or seven distinct beds have been opened along the face of this hill, which is considerably over 100 feet in height, and rises on the west side of the East Branch.

Of these, No. 2 has been opened in several places, and shows about 12 feet in width.

No. 6 has been opened across its width, and shows a section of about 20 feet ore and stone. This belt lies on a dip of about  $40^{\circ}$  to the north on the surface, but plunges over at the bottom of the pit about 15 feet in depth. This belt has been opened east of the road as well.

*Iron Brook.*—From the openings on this brook, some half-mile west of the above, a better idea can be got of the deposits. The widths could not be ascertained accurately, owing to the pits in many

cases being partially filled with debris, but the widths of the veins given below were supplied me by L. McDonald, who acted as guide, and is thoroughly acquainted with the ground. The numbering of the veins commences from the south, and runs northward.

No. 1	said to be 16 feet wide.
" 2	" 10 to 12 feet wide.
" 3	" 10 feet wide.
" 4	" 10 "

No. "A" opened between 4 and 5 appears small, but is not uncovered sufficiently to tell much about it.

No. 5 said to be 5 feet to 6 feet wide.

All these veins contain bands of stone alternating with the ore.

Some distance west of the Iron Brook pits, a vein 6 feet to 7 feet wide, and called the "Tunnel" vein was worked some 8 years ago, by the Nova Scotia Steel Co. These workings include an open cut, a 50 feet shaft and an adit in the hill, and have proved the vein for some 1500 feet along its crop. Several thousand tons were shipped at Arisaig Pier, the ore being carried there by a pole tramway.

#### TORBROOK IRON MINES.

These mines have been idle since the year 1896, but were re-opened in April, 1903, under the management of J. E. Leckie, A. S. Stevens is Underground Foreman, and 50 men are employed.

The underground workings show the following development work to have been done: The mine is opened by three shafts:

No. "2" or the Woodbury, is 312 feet deep.

No. "4" or the Berteaux, is 240 feet deep, and is 335 feet east of No. "2" shaft.

At 275 feet east of No. "4," the "Leary" or No. "5" shaft, is down 112 feet, and the ground stoped out to the east for 160 feet between the bottom level and the surface.

Levels are driven east of shaft No. 4 at 170 feet and 240 feet, for respective distances of 340 feet and 195 feet, and the ground from a point 215 feet from the shaft in the 170 feet level has been sloped up to the 112 feet level.

These two levels are also connected westerly with the No. "2" shaft, and are extended west of this shaft for about 400 feet. Practically all the ore above the 240 foot level, between No. "2" and No. "4" shafts and west of No. "2" shaft, has been removed up to the surface.

At 280 feet in No. 2 shaft, levels have been driven west 212 feet, and east 208 feet, and the ore stoped out above for about half the distance from the shaft to the faces on each side. This vein dips steeply in the upper portion of the shaft, and at from  $45^{\circ}$  to  $50^{\circ}$  farther down. Below the 240 feet level it again becomes steeper in dip.

The ore varies considerably in size, and in places it runs up to 12 feet in thickness.

The vein is apparently lenticular in form, the lenses pitching westerly at a low angle.

This characteristic applies to what was seen in the lower levels and may not be general throughout the mine, no facilities being afforded for a thorough examination of the facts in this connection.

Some distance west of the workings a surface trench some 200 feet long has cut three veins of hematite, measuring 8 feet, 5 feet, and 14 feet, respectively.

No. 2 shaft is the opening used for working the mine and the original steam plant is in use there.

Nearly 5000 tons of ore have been mined during the portion of the financial year that the mine has been worked, and the out-put is being shipped to Londonderry.

#### LONDONDERRY.

During the summer the approaches to the ore bodies were cleaned out and put in order. Mr. A. V. Cameron, the Deputy Inspector, reports timbering and air good.

#### BRIDGEVILLE.

*Bridgeville Mining Co., Bridgeville, Pictou Co.*—A. F. Grant, foreman at mine.

A two hundred foot shaft, which had been opened in 1900, was reopened in May, 1903, and worked till beginning of August, 1903, during which period (May to August) 3,000 tons of Limonite was reported to have been mined and sold to the Nova Scotia Steel Co. About 25 men were working. On July 1st a new shaft was started to the north which, on August 15th, was about 50 feet deep.

## ANTIMONY MINES, WEST GORE.

November, 1903.

The mine was closed in the spring of 1900 and remained idle until Jan. 15th, 1903, when it was re-opened under the charge of C. N. Crowe, the present manager.

Since that date the mine has been pumped out, the shaft and levels cleaned up, a new skip-road put in and a new shaft house and engine house built. This building contains a 75 horse power Babcock & Wilcox water tube boiler and a 30 horse power Lidgerwood hoist. A Rand compound air compressor is also being installed, capable of running 5 drills.

Three shafts were sunk on this north vein as follows :

No. 1. (East shaft.) is 430 feet to the bottom level.

No. 2. (Middle shaft.) 160 feet west of No. 1, is 240 feet deep, and No. 3, the west shaft, 112 feet from No. 2, is about 180 feet deep.

Most of the ground is out between shafts No. 2 and No. 3.

At 114 feet in No. 1, a level has been cleaned out east 120 feet and west 80 feet to connect with a level from No. 2. At 226 feet, an old level has been cleaned out west 81 feet, and connects with a winze sunk from a level driven from No. 2 shaft. Small blocks of stoping had been done above these levels by the previous management.

At 316 feet, a level is in 280 feet east and 80 feet west, and at the bottom, levels are in 30 feet east and 40 feet west, and the ore has been stoped between this and the new level above.

No. 1 shaft, which was vertical for 240 feet and then connected by a 34-foot cross-cut with an inclined shaft on the vein 180 feet deeper.

Connection has been made recently by "raising" between this incline and the vertical portion of the shaft.

The enclosing rock is composed of a very soft slate, and the fissure vein contains Stibnite, native Antimony, Pyrite and occasional coatings of the oxides, Kermesite and Valentinitie.

It runs in places up to 40 inches in thickness, but averages probably less than 10 inches. It may, however, be the intention to treat a greater thickness of belt than this.

I am told that during the summer, experiments carried on for the purpose have solved satisfactorily the question of concentration, and it is anticipated that machinery for this purpose will shortly be installed.

---

On the vein to the south no work has been done since the present re-opening of the mine.

### SILICATE BRICK.

The following letter relates to some tests that were carried out at McGill University Laboratories some time ago on samples from the Silicate Brick Co. at North Sydney, C. B.

Between June and November of this year the Company sold about 700,000 bricks, and state that the demand is increasing rapidly. The low cost of production enables them to put these bricks on the market in competition with the lower grades of clay bricks. They are manufactured from sand 94 per cent. and lime 6 per cent., and after thorough mixing they are subjected to pressure in a mould and later to a steam pressure, when they are ready for use :

FACULTY OF APPLIED SCIENCE, MCGILL UNIVERSITY,  
Montreal, July 12th, 1901.

DEAR SIRS,—Herewith I beg to forward to you the report of the freezing tests carried out upon the sample of brick, in accordance with your instructions.

The original specimen was divided into two parts, and numbered respectively, Spec. 1 and Spec. 2.

The compressive strength of the material in the normal condition was obtained with Spec. 1.

Spec. 2 was subjected to a series of 25 alternate freezing and thawing tests and was then tested for its compressive strength.

The freezing and thawing tests were carried out in the following manner :

The specimen, when thoroughly saturated, was enclosed in a chamber surrounded with the necessary freezing mixture, and subjected to a temperature ranging from 6 degs. to 14 degs. C., for periods which were approximately six hours during the day and fourteen hours during the night.

The thawing was effected by placing the specimen in a glass jar containing water, where it was allowed to remain for about  $1\frac{1}{2}$  hours, until a steady temperature was obtained.

The specimen showed no sign of bursting or cracking, but at the end of the 10th, thawing a slight disintegration at the edges and corners was observed. This disintegration continued throughout the

remainder of the tests, and the particles were subsequently collected and weighed. The same water was used in the whole of the tests.

In determining the compressive strength, the specimens were faced with plaster of Paris.

#### RESULTS.

##### *Specimen 1.*

Weight (normal condition)—1.453 lbs.

Dimensions—3.84 ins. x 2.56 ins. x 2.20 ins.

Load area—9.83 square inches.

Actual crushing load—39,200 lbs.

Crushing load in lbs. per square inch—3,987.

Crushing load in kilogrammes per centimetre—280.9.

##### *Specimen 2.*

Weight (normal condition)—1.4196 lbs.

Weight (after submersion in water for 150 hours)—1.6016 lbs.

Absorption per cent.—12.9 per cent.

Weight of particles disintegrated from corners and edges by alternate freezing and thawing—.0094 lbs.

Load area—9.88 square inches.

Actual crushing load—29,800 lbs.

Crushing load in lbs. per square inch—3,016 lbs.

Crushing load in kilogrammes per centimetre—214.6.

(Sgd.) HENRY T. BOVEY.

All of which, together with the report on the Gold Mines, I beg to submit.

D'ARCY WEATHERBE, C. E.

*Mines Department.*

# BORING MACHINES.

DR. E. GILPIN,

*Deputy Commissioner of Public Works and Mines.*

SIR,—Herewith I beg to hand you the annual report on progress from September 30th, 1902, to September 30th, 1903.

Since my last report the Calyx hand drill mentioned therein has been delivered and used at several points in Cape Breton, as will be noted below. It is termed No. 7 drill.

## ITINERARY.

The following table of the dates of the locations of the different drills since their purchase may be found useful for reference :

No. and Description of Drill.	Locality of Boring.	Mineral Bored for.	Dates of Occupation.
No. 1. ("Calyx" steam) 1000 feet.	Nictaux, Annapolis Co. Kennetcook, Hants Co. River Inhabitants, Rich. Co. Glendale, Richmond Co. Port Hood, Inverness Co.	Iron Coal. " " "	Oct., 1900, to June, 1901. Aug., 1901 to Dec., 1901. Mar., 1902, to Sept., 1902. Sept., 1902, to Oct., 1902. Oct., 1902, to
No. 2. ("Diamond" steam) 850 feet.	Pottles' Lake and Ferris Lake, Cape Breton Co. Drummond Colliery, Pictou Co. Foxbrook Road, do Stanley, Hants Co.	Coal. " " " "	Nov., 1900, to Oct., 1901. Nov., 1901, to Nov. 1902. Nov., 1902, to Sept., 1903. Sept., 1903, to
No. 3. ("Diamond" hand) 400 feet.	Whyecomagh, Inverness Co. Bridgeport Basin, C. B. Co. Mira Road, Cape Breton Co. Polson's Brook, Antigonish Co. Pleasant Valley, Antig. Co.	Iron. Coal. " Iron. Coal.	1901, to Oct., 1901. Nov., 1901, to Nov., 1902. Mar., 1902, to July, 1903. July, 1903, to Oct., 1903. Oct., 1903, to
No. 4. ("Diamond" hand) 400 feet.	Musquodoboit Valley, Hx. Co. Stewiacke Valley, Hx. Co. South Maitland, Hants Co. Lake Ainslie, Inv. Co. Boularderie Island, C. B. Co. Glendale, Inv. Co.	Coal. " " Iron. Coal. "	1901, to Mar., 1902. Mar., 1902 to Oct., 1902. Oct. 1902, to Feb., 1903. Feb., 1903, to May, 1903 May, 1903, to Oct., 1903 Oct., 1903, to

*Table of Dates of Locations of different Drills.—Continued.*

No. and Description of Drill.	Locality of Boring.	Mineral Bored for.	Dates of Occupation.
No. 5. "Calyx" steam) 1000 feet.	Hantsport, Hants Co. Apple River, Cumb. Co.	Coal. " " "	Sept., 1901, to Aug., 1903. Sept., 1903, to
No. 6. "Calyx" steam) 3000 feet.	New Glasgow.	Coal.	Sept., 1902.
No. 7 ("Calyx") 350 feet.	Broad Cove, Inv. Co. Port Hood, Inv. Co. Barra Head, Richmond Co.	Coal. " " " Limestone.	Mar., 1902, to June, 1903. July, 1903, to Sept. Oct., 1903.

## PROGRESS FOR THE YEAR.

*Drill No. 1.*—On the 4th of November, 1902, this drill commenced boring in No. 1 hole at Port Hood, the location of this was about 200 feet south of the supposed crop of the seam now being worked by the Coal Company, and close to their new offices.

## HOLE NO. 1, PORT HOOD.

MATERIAL.	Thickness of Strata.		Total depth from surface.	
	Ft.	In.	Ft.	In.
Surface, etc.....	28	.....	28	.....
Soft dark shale.....	6	.....	34	.....
Grey sandstone.....	7	2	41	2
Soft fawn shale.....	8	7	49	9
Soft dark shale.....	9	.....	58	9
Soft light shale.....	33	5	92	2
Hard dark shale.....	2	.....	94	2

## HOLE No. 1, PORT HOOD.—(Continued.)

MATERIAL.	Thickness of Strata.		Total depth from surface.	
	Ft.	In.	Ft.	In.
Hard fawn colored shale.....	4	8	98	10
Bright coal.....		6	99	4
Fawn colored shale with hard nodules.....	35	11	135	3
Soft dark shale.....	27	11	163	2
Soft fawn shale fossiliferous.....	21	9	184	11
Sandstone, fossiliferous.....	7	7	192	6
Fawn shale, dark bands.....	4	9	197	3
Coal.....		6	197	9
Soft fawn shale.....	6	10	204	7
Fawn shale with dark bands.....	34	11	239	6
Dark clayey shale.....	2	.....	241	6
Soft blue shale.....	26	7	268	1
Fawn shale.....	8	11	277	.....
Fossiliferous sandstone.....	1	.....	278	.....
Fawn Shale.....	3	11	281	11
Fossiliferous sandstone.....	51	8	333	7
Fawn shale.....	4	7	338	2
Fossiliferous sandstone,.....	39	7	377	9
Fawn shale.....	1	.....	378	9
Fossiliferous sandstone.....	5	.....	383	9
Sandstone with 2 bands of dark shale 6" each.	45	4	429	1
Dark shale.....	65	11	495	.....
Softish fawn shale, fossiliferous.....	12	4	507	4
Coal.....	2	8	500	
Dark coaly shale or splint and dark shale..	12	5	522	5
Coal .....	0	4	522	9
Sandstone, fossiliferous.....	6	6	529	3
Hard fawn shale.....	14	7	543	10
Sandstone with coaly bands.....	12	6	556	4
Dark shale with fossils.....	3	.....	559	4
Fossiliferous sandstone.....	4	6	563	10
Dark shale, sandstone band.....	5	11	569	9
Fawn shale.....		9	570	6
Coal.....		6	571	.....
Fawn shale.....	23	2	594	2
Mottled red shale, calcareous.....	4	.....	598	2
Fossiliferous sandstone.....	9	.....	607	2

HOLE No. 1, PORT HOOD.—(*Continued.*)

MATERIAL.	Thickness of Strata.		Total depth from surface.	
	Ft.	In.	Ft.	In.
Fawn shale.....	13	1	620	3
Dark shale.....	1	3	621	6
Reddish mottled shale.....	3	6	625	.....
Dark fossiliferous shale.....	3	6	628	6
Sandstone, dark bands.....	99	3	727	9
Soft blue shale.....	5	5	732	9
Reddish shale.....	5	9	738	6
Soft blue shale.....	6	11	745	5
Sandstone micaceous.....	22	1	767	6
Hard dark blueish shale.....	13	9	781	3
Sandstone micaceous.....	18	5	799	8
Hard fawn shale.....	17	2	816	10
Coal.....	1	6	818	4
Sandstone with shale band.....	13	.....	831	4
Dark clayey shale.....	13	2	844	6

It will be seen that several small seams of coal were intersected, the largest of which was 2 feet 8 inches.

A summary of the cost of the hole, etc., as supplied by the drill runner, J. L. Phinney, is as follows:

Commenced hole, Nov. 4, 1902. Finished hole, Feb. 22, 1903.

Management.....	\$ 372	12
Labour .....	1013	45
Fuel.....	64	50
Oil, waste, light, etc.....	12	88
Shot and gravel, about.....	70	00
	<hr/>	
	\$1532	
Cost per foot, \$1.81.	95	

The apparent low rate of speed of boring was particularly due to the caving of the hole, which necessitated constant washing to obviate the necessity for casing.

## HOLE No. 2.

No. 2 hole was put down at a point 300 feet east of the iron bridge over Little River, and gave the following section :

MATERIAL.	Thickness of Strata.		Total Depth from Surface.	
	Ft.	n	Ft.	In.
Red clay and small boulders.....	25	6	25	6
Coal.....	2	6	28	.....
Dark shale.....	24	8	52	8
Coal.....	.....	6	53	2
Dark shale.....	2	8	55	10
Light shale.....	11	.....	66	10
Dark shale.....	2	8	69	6
Light shale.....	19	5	88	11
Red mottled shale.....	8	.....	96	11
Grey sandstone.....	1	.....	97	11
Light shale.....	10	11	108	10
Red and blue mottled shale.....	8	.....	116	10
Grey sandstone.....	98	7	215	5
Red and blue mottled shale.....	51	.....	266	5
Grey Sandstone.....	19	5	285	10
Fawn shale.....	9	.....	294	10
Grey sandstone.....	4	6	299	4
Fawn shale.....	26	6	325	10
Coal.....	1	6	327	4
Dark shale.....	4	8	332	0
Grey sandstone.....	3	.....	335	0
Blue shale .....	15	.....	350	0
Dark shale.....	6	11	356	11
Light shale.....	1	7	358	6
Coal.....	.....	9	359	3
Dark shale.....	5	.....	364	3
Coal.....	1	.....	365	3
Dark shale.....	3	7	368	10
Light fawn shale.....	10	5	379	3
Light sandstone.....	6	.....	385	3
Soft fawn shale.....	8	10	394	1
Micaceous sandstone.....	36	3	430	4
Coarse white sandstone .....	11	.....	431	3

## HOLE No. 2.—(Continued.)

MATERIAL.	Thickness of Strata.		Total Depth of Strata.	
	Ft.	In.	Ft.	In.
Dark shale.....	18	6	449	9
Coal.....	3	.....	452	9
Dark shale.....	3	.....	453	0
Dark bluish shale with lime nodules.....	19	10	472	10
Coal .....	6	.....	473	4
Dark shale.....	27	9	501	1
Sandstone.....	3	6	504	7
Dark shale.....	4	2	508	9
Fawn shale.....	42	2	551	11
Coal.....	1	9	552	8
Dark shale.....	1	7	554	3
Poor coal.....	1	9	556	0
Fawn shale.....	18	4	574	4
Dark shale, fossiliferous.....	6	.....	580	4
Coal.....	6	.....	580	10
Hard dark shale.....	1	.....	581	10
Coal.....	1	2	583	0
Hard dark shale.....	.....	9	583	9
Micaceous sandstone.....	3	.....	586	9
Hard dark shale.....	6	9	593	6
Coal.....	.....	2	593	8
Dark shale.....	1	4	595	0
Coal.....	.....	3	595	3
Dark shale.....	.....	9	596	0
Micaceous sandstone.....	1	2	597	2
Fawn shale.....	4	1	601	3
Micaceous sandstone.....	1	9	603	0
Fine fawn shale.....	9	3	612	3
Dark shale.....	66	.....	678	3
Coal.....	.....	10	679	1
Dark shale.....	15	3	694	4
Mottled red shale.....	12	11	707	3
Micaceous fine sandstone.....	28	6	735	9

### COST OF NO. 2 BOREHOLE.

Management.....	\$ 240 75
Labor.....	726 00
Oil, Light and waste.....	16 50
Shot.....	56 99
Fuel.....	60 00
<hr/>	
per foot—\$1.49.	\$1100 24

Cost per foot—\$1.49.

\$1100 24

Hole begun Mar. 14, 1903 ; finished May 19, 1903.

Near the bottom of this hole, at 728 feet, the drill runner reported 4 inches of "oily sand," which is not shown in the record.

Hole No. 3 was bored near the south end of Smith's Island, and was commenced on July 2, 1903, and was finished on Sept. 9, 1903.

HOLE NO. 3.

MATERIAL.	Thickness of Strata.		Total Depth from Surface.	
	Feet.	Inches.	Feet.	Inches.
Surface, red clay, etc.....	18	6	18	6
Sandstone with conglomerate bands . . .	76	4	94	10
Conglomerate .....	5	.....	99	10
Grey sandstone, .....	345	.....	444	10
Fawn shale.....	9	1	453	11
Grey sandstone .....	5	7	459	6
Red shale. ....	39	10	499	4
Broken red shale .....	147	1	646	5
Red hard sandstone .....	9	2	655	7
Soft red shale .....	29	.....	684	7
Red and bluish shale. ....	120	9	805	4

### Expense account for above hole:

Management .....	\$335	16
Labor...	1067	00
Fuel .....	105	00
Oil and waste .....	7	60
Shot and Gravel .....	52	00
 Total .....	 \$1566	 76

Cost per foot, \$1.94.

It claimed that this hole, through unnecessary delays, should only have cost about \$1.60 per foot.

No. 4 hole was commenced on October 1st, 1903, at a point 300 feet from the junction of Main and Lawrence streets, on the road to Little Mabou.

The hole was finished Nov. 10, 1903, and the following record shows the strata intersected.

From the section it is difficult to co-relate the horizon of the rocks in this hole with those of Nos. 1, 2 and 3. The records would seem to represent the section exposed on the shore north of Linzee Point, and if this is true, would probably considerably underlie the seam now being worked by the Port Hood Coal Company. On the other hand, it is just possible that this seam turns shoreward as it is followed northerly.

A seam on the Jamieson farm, north of the bore-hole, which was opened some 25 or 30 years ago, might correspond with the seam reported as showing 5 feet of coal in this bore-hole.

A section of this "Jamieson" seam, as supplied me, shows as follows, although this cannot be verified:—

	Feet. Inches.
Coal.....	2
Shale.....	1
Coal.....	1
Shale.....	6
Coal.....	3
Total.....	<hr/> 7      6

## HOLE No. 4.

MATERIAL.	Thickness of Strata.		Total Depth from Surface.	
	Feet.	Inches.	Feet.	Inches.
Surface .....	14	6	14	6
Grey sandstone.....	137	11	152	5
Bluish shale .....	9	2	161	7
Coarse grey sandstone .....	85	5	247	0
Coal .....	1	10	248	10
Dark shale.....	3	.....	251	10
Fine micaceous sandstone .....	3	.....	254	10
Light bluish shale .....	9	6	264	.....
Brown shale.....	3	.....	267	4
Dark bluish shale .....	28	3	295	7
Grey sandstone.....	1	6	297	1
Dark shale.....	17	5	314	6
Grey sandstone.....	60	1	374	7
Dark shale.....	8	6	383	1
Coal .....	2	8	385	9
Splint .....	.....	4	386	1
Shaley Coal .....	5	.....	391	1
Blue shale .....	21	1	412	2
Dark shale.....	4	7	416	9
Coal .....	1	10	418	7
Blue shale .....	6	.....	424	7
Coal .....	2	.....	426	7
Blue shale .....	54	7	481	2
Coal .....	.....	6	481	8
Bluish shale .....	6	.....	487	8
Coal .....	2	3	489	11
Light fawn shale.....	7	9	497	8
Coal .....	2	6	500	2
Bluish shale .....	25	10	526	.....
Coal .....	1	10	527	10
Dark shale.....	6	.....	533	10
Grey sandstone.....	7	8	541	6
Bluish shale .....	6	11	548	5
Dark shale.....	1	4	549	9
Bluish shale .....	2	4	552	1
Dark shale.....	1	2	553	3
Coaly shale .....	1	9	555	.....
Bluish shale .....	16	1	571	1
Dark shale.....	10	11	582	.....

## COST OF NO. 4 BOREHOLE.

Management .....	\$159 00
Labor .....	499 00
Oil, waste and shot.....	56 40
Fuel .....	90 00
	<hr/>
	\$804 40

Cost per foot \$1.38.

*Drill No. 2.*—A hole was put down about a quarter of a mile east of the Foxbrook road, so-called, and about two miles from the Drummond Colliery. This was commenced on November 18th, 1902, and finished on July 10th, 1903.

MATERIAL.	Thickness of Strata.		Total Depth from Surface.	
	Ft.	In.	Ft.	In.
Surface material.....	8	.....	8	.....
Grey friable shale.....	60	.....	68	.....
Light grey sandstone...	22	.....	90	.....
Fine reddish shale...	30	.....	120	.....
Reddish clay (or shale).....	70	.....	190	.....
Hard brown sandstone.....	32	.....	222	.....
Grey sandstone.....	17	.....	239	.....
Reddish clay (or shale).....	27	.....	266	.....
Soft brown sandstone.....	14	.....	300	.....
Red shale.....	34	.....	314	.....
Hard grey shale.....	22	.....	336	.....
Soft sandstone.....	6	.....	342	.....
Light fire clay.....	1	.....	343	.....
Grey broken shale.....	10	.....	353	.....
Grey sandstone.....	8	.....	361	.....
Grey sandstone.....	26	.....	387	.....
Dark red shale.....	84	.....	471	.....
Black shale.....	4	.....	475	.....
Grey sandstone.....	10	.....	485	.....
Grey, very hard sandstone.....	6	.....	491	.....
Red shale.....	129	.....	620	.....

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The drill was then moved during the late summer to Stanley, in Hants County, and boring was commenced on September 22nd, 1903, at a point between the track of the Midland Railway and the Kennetcook River.

*Drill No. 3*.—This drill lay idle in Sydney for some months, and in July it was taken to Polson's Brook, in Antigonish County, where boring was commenced on the 15th.

The object of boring here was iron, but the drill returns were so imperfectly made that the results are very much confused.

It appears, however, that 75 feet was bored in broken reddish slates, and that a thick bed of iron ore was entered near the bottom of the hole.

On October 26th, 1903, the drill commenced boring at Pleasant Valley, in the same county, and drilled 84 feet in sandstones and shales.

*Drill No. 4*.—At Maitland, after boring about 60 feet, the hole was lost by a carbon getting in it, and shortly after, the drill was moved to the store-house at Stellarton.

It was taken in February to Lake Ainslie, and in May to Boulardearie, but in neither of these places was any drilling done.

On October 31st of the present calendar year the drill commenced boring at Glendale, for coal.

*Drill No. 5*.—Boring was continued at Hantsport until August 5th, 1903, when a depth of 1,496 feet was reached. From 985 feet to the bottom the cores showed a continuation of the dark shales and sandstones bored through above and given in last years report.

The drill was then sent to East Apple River in Cumberland County, and commenced boring for coal on September 18th. Upwards of 300 square miles have been covered by rights for coal in this locality during the year.

A record of the hole to date is appended:

MATERIAL.	Thickness of Strata.		Total Depth from Surface.	
	Ft.	In.	Ft.	
Surface material.....	8	.....	8	.....
Light grey sandstone.....	1	.....	9	.....
Reddish gravel.....	1	.....	10	.....
Light greenish grey compact sandstone.....	6	.....	16	.....
Dark argillaceous shales with fossils.....	1	.....	17	.....
Light grey and mottled shales.....	28	.....	45	.....
Reddish sandstone.....	1	6	46	6
Reddish conglomerate.....	3	.....	49	6
Very fine micaceous sandstone.....	5	6	55	.....
Reddish conglomerate.....	13	.....	68	.....
Reddish micaceous sandstone.....	2	.....	70	.....
Reddish conglomerate.....	1	.....	71	.....
Reddish grey shale.....	8	.....	71	8
Black coaly shale.....	8	.....	72	4
Greenish shale with fossils.....	6	.....	72	10
Greenish grey argillaceous shale.....	2	.....	74	10
Greenish grey shale showing graphite.....	4	2	79	.....
Reddish argillaceous shales with greenish blotches showing fossils.....	2	.....	81	.....
Reddish grey very hard sandstone.....	1	.....	82	.....
Reddish conglomerate.....	4	.....	86	.....

*Drill No. 6.*—Commenced boring at about  $1\frac{1}{2}$  miles north of New Glasgow, and  $\frac{1}{2}$  mile west of the East River.

*Drill No. 7.*—This drill is a Calyx hand drill, capable of boring to about 400 feet. It was first used at Broad Cove, and the results gained are as follows:

Hole No. 1 was put down about 2500 feet east of McIsaac's Pond.

MATERIAL.	Thickness of Strata.		Total Depth from Surface.	
	Ft.	In.	Ft.	In.
Sand and pebbles .....	44	6	44	6
Clay .....	6	.....	50	6
Red clay.....	3	.....	53	6
Sandstones .....	9	6	63	.....
Fawn shale.....	2	.....	65	.....
Sandstone .....	3	4	68	4

Cost of the above hole:

Management .....	\$60 00
Labor.....	75 00
Oil, waste, etc. .....	65
Total .....	\$135 65

Cost per foot, \$2.00.

Hole No. 2 was bored for 29 feet, and No. 3 hole for 61 feet, and showed practically the same results as above. The cost of these were respectively \$1.37 per foot and 77 cents per foot.

No. 4 hole gave the following record:—

	Feet.	Inches.	Feet.	Inches.
Sand (and drift wood)....	31	...	31	...
Coal.....	5	8	36	8
Sandstone....	1	4	38	...

The total cost was \$57.70, or \$1.51 per foot.

No. 5 hole showed:—

Material.	Feet.	Inches.	Feet.	Inches.
Sand and cobble stones.....	27	...	27	...
Soft mud.....	4	...	31	...
Cobble stones.....	2	6	33	6
Sandstone.....	30	6	64	...
Coal.....	6	9	70	9
Soft shale .....	1	...	71	9
Sandstone.....	3	...	72	...

This hole cost 71 cents per foot.

The drill was then moved to Port Hood and a hole commenced on July 16th, 1903. This hole was situated 700 feet east of the main street, and on the hill just behind the Old Smith Hotel.

MATERIAL	Thickness of Strata.		Total Depth from Surface.	
	Ft.	In.	Ft.	In.
Surface material.....	23	.....	23	.....
Grey sandstone.....	34	6	57	6
Grey sandstone showing signs of coal.....		7	58	.....
Sandstone showing fossils.....	28	.....	86	.....
Blue shale.....	4	.....	90	.....
Grey sandstone.....	30	.....	120	.....
Blue shale.....	2	.....	122	.....
Grey sandstone.....	31	.....	155	.....
Blue shale.....	2	.....	155	.....
Grey sandstone.....	52	.....	207	.....
Coal.....		4	207	4
Grey sandstone.....	8	.....	215	4
Blue shale.....	7	.....	222	4
Coal.....	2	8	225	.....
Blue shale.....	17	.....	242	.....
Brown mottled shales.....	3	.....	245	.....
Dark argillaceous shales.....	40	.....	285	.....

This hole cost \$1.47 per foot.

The cost sheets for these holes were furnished by the drill runners, and so far as I can ascertain, they are fairly correct. In some cases there are extra expenses incurred by the operator in housing drill, boxing cores, etc., etc.

From the returns made, the results in speed of drilling and cost per foot have been very satisfactory, and show an improvement, and so far as I can learn, compare well with the work done in other places.

I remain

Your obedient servant,

D'ARCY WEATHERBE, C. E.

*Mines Department.*

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## PROVINCIAL MUSEUM AND SCIENCE LIBRARY.

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PROVINCIAL MUSEUM,

Halifax, N. S., 21st December, 1903.

To E. GILPIN, JR., Esq., LL. D., etc.,

*Deputy Commissioner of Public Works and Mines :—*

SIR,—I respectfully present herein a report on the Provincial Museum of Nova Scotia and the Provincial Science Library, for the year 1903.

### PROVINCIAL MUSEUM.

During the year 744 accessions were catalogued, representing 1911 specimens, almost entirely relating to the province. It may be mentioned that during the past four years the following additions have been received :—

1900.....	1202 specimens	=	133 accessions.
1901.....	2660        "	=	545        "
1902.....	2021        "	=	758        "
1903.....	1911        "	=	744        "
Total: 4 years....	7794        "	=	2180        "

*Economic Minerals at Provincial Exhibition.*—Last July I received directions from the Department to collect and install at the Provincial Exhibition to be held in Halifax in September, 1903, a collection of the economic minerals of the province. I accordingly left Halifax on July 21st and proceeded through the province, going as far as Middleton, Amherst and Sydney and visiting intervening localities, finally returning on August 28th to prepare the specimens for exhibit.

As the result, there were displayed at the exhibition, which opened September 9th, about 194 large samples illustrative of most of the deposits of economic importance in the province, and embracing perhaps almost double as many individual specimens. The samples as regards kinds were distributed as follows:

Coal .....	21	Antimony .....	1
Graphite .....	2	Limestone, marble and dolomite .....	9
Petroleum .....	1	Barytes .....	12
Gold .....	24	Building stone and grindstones .....	22
Lead .....	3	Fire-clay .....	3
Copper .....	12	Clay and bricks .....	6
Iron .....	54	Moulding sand .....	3
Gypsum .....	11	Miscellaneous .....	4
Manganese .....	6		

An effort was made to have these specimens of uniform size, a six-inch cube being obtained whenever possible ; and when the mineral was fragmentary it was displayed in a glass-front box of equivalent size. The coals were shown in boxes in uniform lots of about a bushel each. Each specimen was labelled with name, exact locality, owner's name, and the formation in which it occurs. The collection included some very rich gold specimens, the Department's series being complimented by some fine samples lent by individuals. With the specimens were shown maps, plans and a number of photographs of mines, mine buildings and mining plants.

To accompany the collection, I prepared, at your direction, a 39-page descriptive catalogue of the specimens, giving a short history of each deposit, the amount of development, output, nearness to shipping point, name of owner, etc., and, when possible, analyses of the ores. Of this catalogue a large edition was published by the Department and distributed free at the exhibition.

The collection, which occupied the entire north gallery of the main building, attracted, I believe, a good deal of attention and was awarded a medal.

At the close of the exhibition the collection was packed and stored on the grounds, to be again exhibited in future years, the intention being that it should be a permanent one to be added to each year.

The location in which the specimens were shown was not a good one, being in the gallery of the building. It was impossible to exhibit some large specimens which were on hand, and the weight of material may not in future be within the limit of the building's strength when crowded with people. What seems to be most needed, is a separate building in which the specimens can be permanently arranged, and in which individual exhibitors of mineral products can arrange permanent exhibits. An individual exhibitor who has to remove his material at the close of the exhibition, will exhibit but once, or only at rare intervals, whereas if a permanent location were secured, good exhibits would be assured each year from private persons as well as the Department. Minerals do not deteriorate, and are

perhaps more suitable for display in a permanent separate building than any other products shown at an exhibition.

*Minerals in Museum.*—While engaged in collecting these minerals for the exhibition, I was also enabled to secure some 290 specimens of minerals and rocks for the Museum collection, and all of these have since been trimmed, catalogued and labelled.

As stated in the last report, the Nova Scotian economic minerals sent to the Paris International Exhibition of 1900 and afterwards exhibited at Glasgow and Dublin, have been received, and have since been unpacked and incorporated with the collection at this Museum. The set embraces about 109 samples or about 260 individual specimens. It was at first understood that the set would remain in England as mentioned in a previous report.

Thirty specimens illustrating the structure of rocks have been obtained from G. F. Frazar, of Medford. Seventy-eight minerals not represented in our general reference (foreign) collection, were also obtained from the same source, which makes this department of the Museum fairly complete for our needs.

Shelves have been placed under some of the cases to hold the larger mineral samples. Specimens, however, are now on hand, ready, I think, to more than double the case space at present occupied by Nova Scotian minerals.

The principal persons who have donated minerals and rocks are the following:—Rev. D. Sutherland (a large collection of minerals, &c., from the vicinity of Gabarouse, C. B.), Loran A. DeWolfe (rocks from coal-measures of Cape Breton), C. A. Meissner (miscellaneous minerals), F. H. Mason (miscellaneous minerals), A. L. Nichols (minerals, &c., from Kings Co.), J. F. Herbin (trap minerals), Dr. P. A. Holmes, Dr. H. S. Poole, Londonderry Iron and Mining Co., Cumberland Copper Co., Dr. G. C. Hoffmann (specimen of Baddeckite), T. V. Hill, Geo. J. Macintosh, F.W. Fraser, T. Routledge, and C. Stanley Bruce.

*Mammals.*—Efforts have been made to increase our collection of small mammals found in the province, in which I have been assisted by F. H. Reid, of Middleton. We much need specimens of a few of our most valuable fur-bearing animals, the value of whose pelts makes them items of some expense, such as the Sable or Pine Marten, Pekan or Fisher, Beaver, Otter and Bear. The Moose and Woodland Caribou, our chief big game, are unrepresented save by antlers of the former. A peculiar abnormal Hare taken in the woods at Lower Stewiacke has been presented by F. W. Holesworth.

*Birds.*—A number of interesting birds hitherto unrepresented in our cases, have been added, including two Turkey Vultures (*C. aura*), a bird of only casual occurrence in Nova Scotia, one taken at Clark's

Harbor, Shelburne Co., in the fall of 1892, presented by E. C. Allen, of Yarmouth, and the other taken at Middleboro, Cumberland Co., about 1899, presented by Arthur W. Betts, of Amherst. Other rare or interesting species obtained are a Least Bittern (the only individual taken in the province) presented by Mrs. R. T. Murray, Canvas-back Duck, Bartramian Sandpiper, Red-winged Blackbird, Florida Gallinule, Bronzed Grackle, Ipswich Sparrow, Golden Plover and Iceland Gull. What is now chiefly wanted to make the collection fairly complete is some of the rarer species. R. W. Tufts, F. H. Reid, E. C. Allen and L. E. Allen have assisted much in obtaining desiderata in this line.

As in previous years, systematically recorded observations on bird migration have been received from R. W. Tufts, Wolfville; C. R. Harte, Sydney; L. E. Allen, Salem, Yar. Co.; E. C. Allen, Yarmouth; F. H. Reid, Church Point, Digby Co.; J. W. McL. Bouteillier, Sable Island; and others.

*Fish.*—It is found difficult to add much material to the fish collection, although a small number of specimens are secured from time to time. Fish dealers have been requested to bring in any unusual specimens, but with poor results. Among the specimens obtained during the past year is another specimen of the Tautog (*T. onitis*) the second example taken in the province.

*Invertebrates*.—A number of Blue Crabs (*Callinectes sapidus*) have been obtained from Cow Bay and the Eastern Passage, showing that this species has an established habitat in the province. Its occurrence was first noted in my last report. This is the species which is much used for food further to the south, where it is found from Cape Cod to Florida. Among the invertebrates may be noted additions from the Cable Steamship *Minia*, Miss M. Brown and John Moser.

*Botany.* The Museum is much indebted to the New York Botanical Garden (through Dr. Marshall A. Howe, assistant curator) for a valuable collection of 775 specimens of dried plants, collected in 1901 in Nova Scotia and Newfoundland by an exploring party from the Garden. Our herbarium is now of large size and embraces the following collections:

Dr. Lindsay's N. S. herbarium .....	1397	specimens.
N. Y. Botan. Gardens', N.S. and Nfld. plants.	775	"
Dr. How's N. S. Herbarium.....about	325	"
W. H. Prest's Labrador plants.....	259	"
Mrs. Almon's Sable Island plants.....	214	"
W. H. Prest's Wyse's Corner plants.....	177	"
Judge DesBrisay's N. S. algae .....	160	"
Miscellaneous .....	20	"
Total .....	3327	"

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I have not yet been able to mount the large number of loose specimens in the herbarium, which must be done before they are available for examination.

*Miscellaneous.*—John A. Wilson, sculptor, of Boston, a native of Pictou Co., N. S., has donated an enlarged photograph of a spirited statue of a lion, an original design of his and giving evidence of much promise.

As usual, a good deal of information, both by letter and verbally, regarding the minerals and other resources of the province, has been supplied in answer to inquiries which are constantly received.

A list of donors is appended:

DONORS.

Acadia Coal Co., Stellarton; Allen (E. C.), Yarmouth; Allen (L. E.), Salem; Almon (Albert), Sydney.

Baird (Jas.), Chignecto Mines; Bayne (A. R.), Boston; Betts (Arthur W.), Amherst; Bishop (Walter B.), Canning; Bliss (Wm.); Bouteillier (J. W. McL.), Sable Island; Bown (E. T.), Eskasoni; Brown (E. Percy), Bridgewater; Brown (Miss M.); Brown (R. H.); Bruce (C. Stanley), Shelburne; Burgess Bros., Cheverie.

Cain (Dr. H. W.), Bridgewater; Canada Coals & Ry. Co., Joggins; Cape Breton Silicate Brick Co., North Sydney; Carlyle (Fred.) Waverley; Cheticamp Gold Mining Co.; Chignecto Mine, Cumberland Co.; Churchill (Geo. W.), Hantsport; Collie (Dr. Jas. R.), River John; Corbett (Geo. E.), Annapolis; Cumberland Copper Co., Wentworth Centre.

DeWolfe (Loran A.), North Sydney; Dixon (R.), Antigonish; Dominion Antimony Co.; Dominion Iron & Steel Co., Sydney; Dustan (W. M.), Pictou.

Eastern Milling Co., Dartmouth.

Ferguson (Neil), Sydney; Fletcher (Hugh), Springhill; Francklyn (Geo. E.); Fraser (F. W.), Pictou.

Gammon (Wm.), River John; Gentles (Jas.), Windsor; Geological Survey of Canada, Ottawa; Gilpin (Alfred E. Haliburton-); Gilpin (Dr. E., Jr.)

Hallock (Charles), Washington, U. S. A.; Harrison (J. W.), Parrsboro; Harte (Charles Rufus), Sydney; Hayes (Dr. Joseph), Parrsboro; Henderson & Potts; Herbin (J. F.), Wolfville; Hicks (John H.), Bridgetown; Hill (T. V.); Hoffmann (Dr. G. Chr.), Ottawa;

Holesworth (F. W.), Stewiacke ; Holmes (Dr. P. A.), Parrsboro ; Holmes (Hon. S. H.) ; Horn (J. W.), Brandon, U. S. A. ; Houldsworth (W. J.) ; Howe (Dr. Marshall A.), New York, U. S. A. ; Huggins (Geo. M.), Barrington Passage.

Ilsley (Stephen), Berwick ; International Brick & Tile Co., Bridgetown ; Inverness Mining Co.

Johnstone, A. D.

Keddy (N. W.), Berwick ; Kirkpatrick (Robie), Parrsboro.

Langille (Miss), Oliver ; LeVatte (H. C. V.), Louisbourg ; Lithgow (Wm.) ; Londonderry Iron & Mining Co., Londonderry ; Lorimer (Wm.), Springhill ; Lowe (J. Seaman), Amherst ; Lynn (Lambert), Bedford.

MacAloney (John) ; McDonald (Archibald), Whycocomagh ; McDonald (Col. Chas. J.) ; Macdonald (C. Ochiltree) ; McDougall (H. F.), Christmas Island ; McFatridge (Wm.) ; McGillivray (Angus) ; McGillivray (Colin) ; Macintosh (Geo. J.) ; McIntosh (Peter), Pleasant Bay ; McKay (Sheriff), Baddeck ; McKay (Alexander), Lansdowne ; MacKay, (Dr. A. H.) ; MacKean (Mrs. Albert) ; McKenzie (Jas. W.) ; McKenzie (John A.) , Sydney ; McLean (—), Whycocomagh, McPherson (Rev. M. A.), Little Bras d'Or ; McPherson (W. A.) ; Pugwash Junction ; Magee (Dr. W. H.), Parrsboro ; Malpas (C. W.), H. M. S. "Indefatigable" ; Maritime Clay Works, Pugwash ; Mason, (Alfred E. Harley), London, Eng. ; Mason, (F. H.) ; Meissner (C. A.) ; Sydney ; Mines Department of N. S. ; Mira Brick Co., Mira River ; Mitchell (Thos.), Whycocomagh ; Moffatt (Chas. P.), North Sydney ; Morgan (Jenkins), Springhill ; Moseley (E. W.), Sydney ; Moser (John) Butternut Ridge, N. B. ; Mosher (Thos. A.), Windsor ; Muller (J. T. H.), Windsor ; Murray (Mrs. Robert T.).

National Zoological Park, Washington, U. S. A. ; New York Botanical Garden, New York, U. S. A. ; New Ross Manganese Co., New Ross ; Nichols (Arthur L.), Berwick ; Nova Scotia Colliery, Maccan ; Nova Scotia Oil and Gas Co. ; Nova Scotia Steel Co.

Perrin (J.), McNab's Island ; Phinney (J. L.) ; Pictou Quarries Co., Pictou ; Poole (Dr. Henry S.) ; Provincial Normal School, Truro.

Reid (Frank H.), Middleton ; Routledge (T.). Sydney.

Shipley (Fred. S.), Brookdale ; Silver (Arthur P.) ; Sinclair (Archibald), Bridgeville ; Sinclair (J. H.), M. P. P., New Glasgow ; Stayner, (Chas.) Strachan (John) ; Sutherland (Rev. Donald), Gabarouse ; Sydney Coal Co., North Sydney.

Taunton (Wm. D.) ; Truro Foundry and Machine Co., Truro ; Tufts (Robie W.) Wolfville.

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Wallace Stone Co., Wallace ; Weatherbe (D'A.) ; Wentworth Gypsum Co., Windsor ; Wier (H. V.) ; Wilkie (C. N.), Antigonish ; Wilson (John A.), Boston, U. S. A. ; Windsor Foundry & Machine Co., Windsor ; Windsor Gypsum Co, Windsor ; Windsor Plaster Co., Windsor ; Woodworth (John E.), Berwick.

Young (P. L.), London, Eng.

#### SCIENCE LIBRARY.

During the year about five hundred dollars worth of new manuals and comprehensive treatises have been ordered, embracing some of the most recent works on the various branches of mining, prospecting, mine accounts and book-keeping, metallurgy, metallography, assaying, chemistry, electricity, geology, physical geography, mineralogy, lithology, palæontology, climatology, agriculture, horticulture, animal breeding and feeding, poultry keeping, bee keeping, botany, forestry, zoology, building construction, plumbing and heating, stone working, brick and tile making, road construction, bridge building, tanning, foundry practice, fuels, hygiene and sanitary engineering, and education.

The majority of the books deal with mining and the related sciences, and the value of the Library is apparent in its relationship to the School of Mining recently established in this city. In purchasing books, the bearing of the Library on the industries and resources of the country is kept constantly in mind, and the opinion of specialists has been obtained regarding the selection of works.

Besides the great number of exchanges from scientific societies coming to us as usual through the Nova Scotian Institute of Science, accessions have been received through the Mining Society of Nova Scotia and further transfers from the Legislative Library, the Department of Mines, the Secretary for Agriculture, Dr. Gilpin and R. H. Brown. Dr. H. S. Poole has presented four manuscript volumes containing a continuous series of meteorological observations made from October, 1842, to April, 1854, at Albion Mines, Pictou Co., by the late H. Poole.

I feel that the transfer of scientific works from the Legislative Library will not have been completed until the various pamphlets on scientific subjects, especially those relating to the province, have passed to this Library. In order to concentrate all our resources, the transfer should be carried to completion and not merely include the bound volumes.

The fifty-seven volumes reported in the binder's hands last year have been returned and the same number has since been sent to him and again placed on the shelves.

It may be mentioned that after a good deal of difficulty a complete set of the reports of the Mines Department of Nova Scotia has been obtained and bound in three volumes.

The first annual issue of the International Catalogue of Scientific Literature, to which the Library subscribed, is now about completed and furnishes ready references to the vast amount of material appearing in the scientific serials of the year.

The following list of the non-society periodicals received, may be of interest:—

Canadian Mining Review, Ottawa.  
Coal Trade Journal, New York.  
Colliery Guardian, London.  
Educational Review, St. John.  
Engineering and Mining Journal, New York.  
Industrial Advocate, Halifax.  
Maritime Mining Record, Stellarton.  
Mines and Minerals, Scranton, Pa.  
Mining Journal, London.  
Nature, London.  
Science, New York.  
Scientific American Supplement, New York.

The Mining Society of Nova Scotia and the N. S. Institute of Science have held meetings in the reading room.

I beg respectfully to call attention to the necessity for much more binding being done, as referred to in my last report, for the large number of serials that come to the Library need binding before they become readily accessible or even capable of proper preservation.

Among our greatest needs just now, are a card catalogue of the manuals and other treatises and a preliminary short-title catalogue that can be distributed to readers. The greater facilities there are for the public to ascertain what books we possess and the more the Library is used (and the latter is often a result of the former), the sooner will good results be manifest in improved methods in the various industries on which the Library bears.

Among the people, perhaps, who least use the Library and yet who would be much profited by so doing, are the agriculturists. We have a number of good modern treatises on all or most of the departments in which they are interested, and a large amount of literature is received from the various American agricultural experiment stations.

I have the honor to be, Sir,

Your most obedient servant,

HARRY PIERS,

*Curator and Librarian.*

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I remain, Sir,

Your obedient servant,

E. GILPIN, JR.,

*Deputy Commissioner of Public Works and Mines and Inspector of Mines.*

### **ERRATA.**

Memo. of Barytes mined by Eastern Milling Co. during season 1903:

Cape Rouge, Inverness Co., C. B ..... 200 tons.  
Lake Ainslie, Inverness Co. ..... 500 "

Page 57, 33rd line, after "surface" should be added, "according to the Company's mine plan."

Page 62, 2nd line, "breciated" should be "brecciated."

Page 63, 8th line, "Ostermoor" should be "Overstrom." On same page, 5th line, "Florry" should be "Flory."

Page 64, 20th line, "Leary" should be "Seary."



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**TABLES.**

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## LIST OF MINERAL LEASES (OTHER THAN GOLD.)

## IRON.

No. of Lease.	Name of Owner.	Country.	Agent or Owner.	Address.
247.....	McNeil, Hector F., et al.....	Cape Breton.	H. F. McNeil.....	Lorway Mines, C. B.
191, 197.....	McVicar, John, est. of.....	"	A. G. McLean.....	Sydney, N. S.
289.....	Greener, John, est. of, et al.	"	Isabella Watson .....	North Sydney, N. S.
292.....	Smith, Wiley .....	"	Wiley Smith .....	Halifax, N. S.
258, 259, 260.....	MacPherson, M. A., Rev. ....	"	M. A. MacPherson. ....	Little Bras d'Or, C. B.
47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 87, 93/44	Bartlett, James H. .... N. S. Steel & Coal Co. .... Cameron, John A., et al..... Fraser, R. P., et al..... Cape Breton Iron Co. Ltd. .... Fraser, William A. .... McDonald, Lauchlin .....	Pictou .....	J. H. Bartlett .....	Middlesborough, Ky., [U. S. A.]
68, 71, 83, 70.....	N. S. Steel & Coal Co. ....	"	"	New Glasgow, N. S.
61.....	Cameron, John A., et al.....	"	J. A. Cameron .....	St. Paul's, E. R' r, Pictou,
10.....	Fraser, R. P., et al.....	Inverness.....	R. P. Fraser .....	Pictou, N. S. [N. S.]
57.....	Cape Breton Iron Co. Ltd. ....	"	R. Drummond .....	Stellarton, N. S.
99.....	Fraser, William A. ....	"	V. A. Fraser .....	
7.....	McDonald, Lauchlin .....	Antigonish .....	L. McDonald .....	Antigonish, N. S.
8, 9, 10, 11.....	Cowlam, Geo. B., et al .....	"	C. B. Whidden .....	"
16.....	Workingmen's Prospecting, Develop'g & Mng' Co. Ltd.	"	"	J. W. Keith .....
296.....	Hamilton, A. G., et al. ....	Cape Breton.	A. G. Hamilton .....	North Sydney, N. S.
310.....	C.B. Coal, Iron & Ry. Co., Ltd	"	Neil Ferguson .....	Sydney, N. S.
19.....	Copeland, John D. ....	Antigonish .....	J. D. Copeland .....	Antigonish, N. S.

14, 17, 18.....	Wilkie, C. N. ....	C. N. Wilkie .....	Antigonish, N. S.
1, 2.....	N. S. Steel & Coal Co. ....	New Glasgow, N. S.	
232, 257.....	Brookman, S. J., est., et al. ....	Cape Breton. ....	Sydney, N. S.
1.....	Smith, W. H., est., et al. ....	E. W. Moseley .....	Hauts. ....
12.....	Matheson, Joseph. ....	M. B. Smith. ....	Halifax, N. S.
311.....	Burchell, John E. ....	Joseph Matheson .....	L'Ardoise, C. B.
7.....	Curry, Nathaniel, et al. ....	J. E. Burchell. ....	Sydney, N. S.
		T. S. Rogers .....	Amherst, N. S.
6.....	COPPER, LEAD, Etc.	" .....	
126.....	Jenkins, T. K., est., et al....	Eastern Trust Co. ....	Halifax, N. S.
286, 287, 70/95, 106, 250.....	Matheson, Alex ....	A. Matheson. ....	Sydney, N. S.
181.....	Cape Breton Copper Co. ....	Cape Breton. ....	
218.....	Burchell, John E., et al. ....	Isaac P. Gragg .....	
277.....	MacKenzie, John A., et al. ....	J. E. Burchell. ....	Sydney.
6.....	McInnis, Hector ....	" .....	
5.....	McLennan, John S. ....	J. A. McKenzie. ....	Sydney.
58, 59, 62, 102, 103.....	Colonial Copper Co. ....	H. McInnis. ....	Halifax, N. S.
55.....	Inverness Mining Co., et al. ....	Victoria. ....	J. S. Mc Lennan. ....
5, 16.....	Cheticamp Gold Mng. Co. ....	Colchester. ....	Halifax, N. S.
12.....	Fraser, John H. ....	F. W. Hanright. ....	
13.....	McDonald, John H. ....	" .....	
88.....	McDonald, A. K., et al. ....	J. W. Regan. ....	" .....
3.....	Holmes, S. H. ....	" .....	" .....
139.....	Simpson, H. O., et al. ....	Jas. Harrison. ....	New Glasgow, N. S.
4.....	McPherson, W. A. ....	Antigonish. ....	Sherbrook, N. S.
94.....	Cameron, John J. ....	J. H. Fraser. ....	South River, Antig. Co.
2, 3.....	Pray, Henry C. ....	" .....	Dartmouth, N. S.
	Franklyn, Geo. E., et al. ....	W. A. McDonald. ....	Plugwash, N. S.
		" .....	J. J. Cameron, M. D. Antigonish N. S.
		Pictou. ....	
		Halifax. ....	
		H. O. Simpson. ....	
		Cumberland. ....	
		Antigonish. ....	
		Pictou. ....	
		J. J. Cameron. ....	
		Franklyn. ....	

## LIST OF MINERAL LEASES (OTHER THAN GOLD.)—(Continued.)

## COPPER, LEAD, ETC.

No. OF LEASE.	NAME OF OWNER.	COUNTY.	AGENT OR OWNER.	ADDRESS.
135A.....	McKenzie, Roderick .....	Cape Breton..	Rod. McKenzie.....	Sydney, N. S.
142.....	LeCras, Henry.....	"	Henry LeCras.....	Sydney, N. S.
145.....	McLean, John.....	"	.....	.....
89.....	Creelman, Wm. et al.....	Pictou .....	Wm. Creelman.....	Truro, N. S.
9, 10.....	Carre, Frederick E.....	Victoria .....	F. E. Carre.....	North Sydney, N. S.
COAL.				
83, 84, 85.....	Barton, A. McG., est.....	Pictou .....	Wm. Roche, M. P.....	Halifax, N. S.
31, 1/23, 2/42, 3, 4, 69, 95.....	Acadia Coal Co.....	"	Acadia Coal Co.....	Stellarton, N. S.
5/12, 6/13, 7/14, 66.....	Intercolonial Coal Mng. Co.....	"	.....	Westville, N. S.
46, 8/6.....	N. S. Steel and Coal Co.....	"	.....	New Glasgow, N. S.
10/24.....	Richey, M. H. ...., et al.....	"	M. H. Richey .....	Halifax, N. S.
11/11, 45, 9/10.....	(iray, B. G., est., et al.....	"	Victor G. Gray.....	Montreal, P. Q.
22/51, 56, 104, 156, 157, 158.....	{			
159, 160, 161, 162, 163, 168....	Canada Coals and Ry. Co.	Cumberland .....	F. Burrows.....	Joggins Mines, N. S.
164, 165, 166, 167, 168....	}			



## LIST OF MINERAL LEASES (OTHER THAN GOLD).—(Continued.)

## COAL.—(Continued.)

No. OF LEASE.	NAME OF OWNER.	COUNTY.	AGENT OR OWNER.	ADDRESS.
173, 58/67, 298, 299, 300, 301, 303, 302, 304, 305,	Weatherbe, Robert L.....	Cape Breton..	R. L. Weatherbe.....	Halifax, N. S.
306, 307.....	Sydney Coal Co.....	"	A. G. Hamilton.....	North Sydney, N. S.
111, 164.....				
45/5, 46/28, 47/29, 50/40 51/41, 52/42, 60/54, 61/55, 62/56, 63/57, 64/58, 65/59, 66/60, 67/61, 68/62, 69/63, 108, 109, 110, 188, 207, 140, 252, 253, 254, 255, 256, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 274, 278, 279, 280, 162, 239, 240.....	Dominion Coal Co.....	"	Glace Bay, C. B.	
290.....	McDonald, Alex.....		Alex. McDonald.....	Salem Road, C. B.
117, 246.....	Hamilton, A. G.....		A. G. Hamilton.....	North Sydney, N. S.
214, 220.....	Cayley Hugh St. Q.....		Borden, Ritchie & Co Halifax, N. S.	
179, 180, 168, 190, 208, 223, 284.....	{ Roberts, Frank.....		F. Roberts.....	"
130.....	Bennett, Samuel C.....		S. C. Bennett.....	"

212, 128, 131, 129, 134, 135, 139, 144, 219.....	Moseley, F. T., est.....	Sydney, N. S.
203, 224.....	White, Alonzo J.....	Halifax, N. S.
141, 177, 213, 244, 112, 113, 114, 115, 116, 118, 283.....	Cumberland Railway & Coal Co.....	Springhill, N. S.
146, 193, 194, 216, 235, 312, 313, 314, 315.....	Dowrie & Blockhouse Col- lieries, Ltd.....	"
169, 170, 183, 297.....	McVey, James.....	"
178.....	Routledge, Ellen, et al.....	"
165.....	Stephens, L. H., et al.....	"
163, 185.....	Hamilton, C. F., est.....	"
291.....	McCuish, D. A., et al.....	"
243, 171, 174.....	Gorham, J. W.....	"
136, 138, 184, 199, 211, 236, 232, 257.....	Atlantic Coal Co.....	"
282, 308, 309.....	Brookman, S. J., est.....	"
285.....	Moseley, E. W.....	"
293, 294.....	McGowan, John.....	"
233.....	Macpherson, Rev. M. A.....	"
186, 187, 202, 205, 206, 209, 210.....	Burchell, J. T., et al.....	"
195, 222, 237, 161, 201, 221.....	Kennelly, D. J.....	"
192, 215, 217, 226, 229, 234, 281, 295.....	Harold, T. C.....	"
175.....	Routledge, Thomas.....	"
182, 200, 225.....	Hickey, Cornelius.....	"
167.....	Cape Breton Coal, Iron and Ry. Co., Ltd.....	"
295.....	McDonald, Joseph.....	"
	Cossitt, G. G., et al.....	"
	Murray, John.....	"
	McVicar, John, est.....	"
	Neil Ferguson.....	"
	Joseph McDonald.....	"
	G. G. Cossitt.....	"
	Rev. John Murray.....	Clifton, P. E. I.
	A. G. McLean.....	Sydney, N. S.

## LIST OF MINERAL LEASES (OTHER THAN GOLD.)

CoAL.—(Continued.)

NUMBER OF LEASE	NAME OF OWNER	COUNTRY.	AGENT OR OWNER	ADDRESS.
218.....	Morrison. Donald.....	Cape Breton.	D. Morrison.....	Sydney, N. S.
248.....	McMillan, John, et al.....	"	A. E. Reid.....	Merrickville, Ontario.
275, 276.....	Petrie, Louis A.....	"	L. A. Petrie.....	Glace Bay, N. S.
1/13, 6/4, 7/10, 19, 20, 26, 1/29, 30, 111, 112, 113.....	Port Hood Coal Co.	Inverness .....	Wm. Lithgow.....	Halifax, N. S.
125, 126.....	C. B. Expl. Coal & Dev. Co.	"	Peter Ryan.....	Toronto, Ontario.
231.....	Owen, J. M., et al.....	Cape Breton.	W. H. Owen .....	Bridgewater, N. S.
1/2.....	C. B. Coal Mng. Co.	Victoria .....	J. T. Burchell .....	Sydney, N. S.
7, 8.....	Dominion Coal Co.	"	" .....	Glace Bay, C. B.
8, 9, 106, 107, 114, 115, 116, 117, 118, 119, 120, 121.....	Mabou Coal Mng Co., Geo., et al.....	Inverness .....	J. B. Cann .....	Mabon, N. S.
11.....	Dawson, Geo., et al.....	"	Geo. Dawson .....	Providence, R. I.
15, 18, 23, 24, 25, 28, 27, 40, 41, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 60, 61, 100, 101, 104, 105, 123, 127, 130, 3/11.....	Inverness Ry. & Coal Co. Ltd.....	" .....	J. L. Brass .....	Broad Cove, C. B.
128, 129.....	National Trust Co.	" .....	J. L. Brass .....	Broad Cove, C. B.
124.....	Gorham, J. W., et al.....	" .....	J. W. Gorham .....	Halifax, N. S.
35, 38, 39.....	Ross, Wm., et al.....	" .....	Hon. Wm. Ross, M.P. ....	Halifax, N. S.

43, 44.....	Farquhar, J. A., et al.....	"	Wm. Roche, M. P.....
31.....	Sutherland, W. A., et al.....	"	Edward Harris.....
32, 33, 34, 42.....	Wallace, C. M., et al.....	"	T. A. Wallace, M. D. Halifax, N. S.
63, 64, 65, 96, 97, 98.....	Taylor, Ira.....	"	Wm. Roche, M. P.....
66, 108, 109.....	Lithgow, J. R.....	"	J. R. Lithgow.....
67, 68.....	McDonald, W. B.....	"	Wm. Roche, M. P.....
69.....	McInnis, Lecter, et al.....	"	H. McInnis.....
70, 71, 72, 77, 78, 79, 80.....	Roche, William.....	"	Wm. Roche, M. P.....
73, 74, 75, 76.....	Townsend, Silas, est.....	"	" .....
81, 110.....	Caldwell, Thomas, et al.....	"	T. Caldwell.....
82, 85, 88.....	Andrews, J. W.....	"	J. W. Andrews.....
84, 83, 86, 87, 88, 90, 91, 92.....	Herman, Chas. E.....	"	New York, U. S. A.
93, 94, 95.....	Ross, Wm., et al.....	"	Halifax, N. S.
34.....	Richmond.....	"	
7, 8.....	Terminal City Co.....	"	
5, 36.....	N. Am. C. & D. Co., Ltd.....	"	
3.....	Reynolds, W. K., et al.....	"	
37, 11.....	Eastern Development Co....	"	
17, 18, 19, 20, 21, 22, 23.....	Pearl, H. M.....	"	
24, 25, 26, 27, 28, 29, 30, 31, 32, 33.....	Dominion Coal Co.....	"	Glace Bay, C. B.
6.....	Jenkins, T. K., est.....	Colchester.....	Eastern Trust Co.....
15.....	Corbett, John E., et al.....	Antigonish.....	J. E. Corbett, M.L.C. Harbor Au Bouche, N.S.

## COAL.—SALES.

NAMES.	1st Quarter.	2nd Quarter.	3rd Quarter.	4th Quarter.	Year 1903.	Year 1902.
<b>NOVA SCOTIA :</b>						
Land Sales.....	143,494	146,531	141,322	113,738	545,085	580,616
Sea Borne.....	307,435	242,633	247,611	262,713	1,060,392	801,947
Total N. S.....	450,929	389,164	388,933	376,451	1,605,477	1,382,563
New Brunswick .....	92,414	102,456	93,347	88,505	376,722	319,338
Newfoundland .....	33,456	25,577	33,127	41,002	133,162	105,287
P. E. Island.....	24,017	30	30,221	24,204	78,472	56,203
Quebec .....	282,941	177,769	417,723	525,483	1,403,916	1,243,980
West Indies .....	.....	.....	.....	.....	.....	5,982
United States.....	300,758	302,925	208,414	156,735	968,832	751,382
Other Countries .....	15,663	7,709	15,440	15,681	54,493	33,891
Total ,.....	1,200,178	1,005,630	1,187,205	1,228,061	4,621,074	3,898,626

## COAL—GENERAL STATEMENT.

1903.	Produce.	Sales.	Colliery Consumption.	
			Engines.	Workmen.
1st Quarter.....	1,420,310	1,200,178	90,818	14,118
2nd " .....	1,266,252	1,005,630	89,628	26,995
3rd " .....	1,281,608	1,187,205	78,536	18,296
4th " .....	1,277,077	1,228,061	134,064	16,094
Total.....	5,245,247	4,621,074	393,046	75,503

TABLE A—COAL TRADE BY COUNTIES FOR THE YEAR ENDED SEPTEMBER 30TH, 1903.

	CUMBERLAND.		PICTOU.		CAPE BRETON.		OTHER COUNTIES.		TOTAL.	
	Raised.	Sold.	Raised.	Sold.	Raised.	Sold.	Raised.	Sold.	Raised.	Sold.
1st Quarter.....	154,530	142,262	171,426	154,626	1,042,759	861,966	51,595	41,324	1,420,310	1,200,178
2nd “.....	148,432	139,468	174,639	150,037	898,309	689,561	41,872	26,564	1,266,252	1,005,630
3rd “.....	148,341	128,292	183,656	158,444	888,926	847,018	60,685	53,451	1,281,608	1,187,205
4th “.....	142,172	121,899	168,122	156,130	889,406	881,360	77,477	68,672	1,277,077	1,228,061
Total.....	593,475	531,921	697,743	619,237	3,719,400	3,279,905	234,629	190,011	5,245,247	4,621,074

PRODUCTION AND SALES BY COLLIERIES.  
YEAR ENDED SEPTEMBER 30TH, 1903.

COLLERY.	PLACE.	Production.	Sales.	Colliery Consumption.	
				Engines.	Workmen.
Maritime Coal Co. ....	Chignecto.....	16,107	12,493	3,058	3,533
Fundy Coal Co. ....	Fundy.....	1,953	1,240	369	157
Canada Coals & Railway Co. ....	Joggins.....	52,160	38,768	11,449	1,503
Minudie Coal Co. ....	Minudie.....	32,241	29,068	2,092	681
Ripley & Blenkhorn	Scotin.....	442	296	70	36
Cumberland Railway & Coal Co. ....	Springhill .....	500,572	450,056	31,247	16,221
Acadia Coal Co. ....	Westville and Stellarton.....	397,419	346,632	43,039	6,907
Intercolonial Coal Mining Co. ....	Drummond.....	249,448	226,221	16,565	4,282
N. S. Steel & Coal Co. ....	Marsh ...	50,846	46,384	3,512	40
Dominion Coal Co. ....	Dominion.....	3,283,117	2,900,004	219,050	30,315
Gowrie and Blockhouse Collieries . .	.....	26,192	22,338	1,782	786
N. S. Steel & Coal Co. ....	Sydney Mines .....	397,366	345,492	32,401	7,786
Sydney Coal Co. ....	Indian Cove .....	12,725	12,071	84	199
Cape Breton Coal Mining Co. ....	New Campbellton .....	8,748	4,883	2,880	1,270
Port Hood Coal Co. ....	Port Hood .....	74,518	65,631	4,544	1,433
Mabou Coal Mining Co. ....	Mabou .....	6,124	107	3,474	263
Inverness Railway & Coal Co. ....	Inverness .....	145,239	119,390	17,430	3,271
Total.....		5,255,247	4,621,074	393,046	75,503

TABLE B—COAL TRADE BY COUNTIES.

	CUMBERLAND.	PICROU.	CAPE BRETON.	OTHER COUNTIES.	TOTAL.
Nova Scotia—By land.....	90,485	231,998	153,657	44,305	520,445
By sea.....	24,640	82,485	919,775	58,532	1,085,032
Total . . . . .	115,125	314,083	1,073,432	102,837	1,605,477
New Brunswick .....	222,458	54,286	88,669	11,309	376,722
Newfoundland . . . . .	.....	.....	128,916	4,246	133,162
P. E. Island . . . . .	.....	40,751	28,451	9,270	78,472
Quebec . . . . .	82,668	119,552	1,161,771	39,925	1,403,916
West Indies.....	.....	.....	.....	.....	.....
United States.....	111,670	89,583	745,155	22,424	968,832
Other Countries.....	.....	982	53,511	.....	54,493
Total . . . . .	531,921	619,237	3,279,905	190,011	4,621,074

*Statement of Number and Classes of Men Employed, etc., at each Mine during the year ended Sept. 30th, 1903.*

COLLIERY.	UNDERGROUND.				ABOVE GROUND.				CONSTRUCTION.				TOTAL.				HORSES.		PITS WORKED.	
	Skillful Labor.	Boys. Days.	Laborers.	Skilled Labor.	Boys. Days.	Laborers.	Skilled Labor.	Boys. Days.	Laborers.	Boys. Days.	Laborers.	Skilled Labor.	Boys. Days.	Laborers.	Persons.	Total.	Above.	Below.	Days.	Years.
Chignecto .....	14	6	2	6945	3	10	1	4067	9	10	...	7552	55	18564	1	231	...	...	...	231
Fundy .....	5	1	16	2332	4	1	1749	1749	2	...	540	13	4621	...	185	...	...	...	185	
Joggins .....	82	87	16	55243	9	79	13	3295	...	...	...	286	87538	7	9	298	...	...	298	
Minudie .....	38	18	2	13447	10	17	2	6326	1	...	...	162	88	19935	1	281	...	...	...	281
Springhill .....	530	430	119	282009	150	195	50	134365	...	...	...	1454	416374	24	47	262	...	...	262	
Acadia .....	320	409	69	197534	60	220	32	92867	...	...	...	1120	29401	23	34	299	...	...	299	
Internocolial .....	266	152	68	118113	59	124	17	52449	4	12	...	5420	702	173982	14	23	298	...	...	298
Marsh .....	36	37	9	20946	11	14	1	7745	...	...	...	108	28691	2	...	253	...	...	253	
Dominion .....	1400	1333	290	1079689	407	490	40	318543	231	...	...	70947	4791	1469179	67	485	300	...	...	300
G. & B. House .....	35	25	8	19040	13	15	6	9520	5	13	...	5080	120	33640	2	280	...	...	...	280
Sydney Mines .....	766	136	49	226268	182	254	24	120715	106	9	...	25552	1526	372535	14	110	296	...	...	296
Indian Cove .....	25	14	...	8235	2	6	...	1837	...	...	...	47	10072	...	...	287	...	...	287	
New Campbellton .....	16	13	3	4004	11	...	...	1476	34	...	...	5185	77	10675	...	125	...	...	125	
Port Hood .....	71	80	9	60510	12	49	6	26260	8	...	...	3045	235	8945	5	6	219	...	...	219
Mabon .....	26	19	25	13195	14	21	1	10116	16	6	2	7128	105	30439	4	292	...	...	292	
Broad Cove .....	124	76	25	80500	25	100	15	55000	...	...	...	365	135500	6	12	280	...	...	280	
	3764	3426	669	2188020	952	1595	208	875330	416	50	2	130611	11092	3193961	207	726	...	...	...	

*Expenditure of Coal Mines of Nova Scotia for Year ended September 30th, 1903.*

MINES REPORT.

xx

Name.	Shafts.	Slopes.	Levels.	Machinery.	Buildings.	Dwellings.	Collievery.	Wharves.	Railways.	Miscellaneous.	Total.
Chignecto.	534	\$23327	\$1125	\$18346	\$1153	\$12101	.....	.....	\$ 1701	.....	\$ 57753
Fundy.....	6014	581	607	816	.....	.....	.....	.....	119	.....	8671
Joggins.....	624	398	1456	2319	.....	.....	.....	.....	.....	.....	2319
Minudie...	.....	.....	.....	652	125	200	50	.....	.....	.....	3505
Springhill.....	.....	.....	.....	40000	3512	806	13072	.....	.....	10000	50000
Acadia.....	.....	.....	744	14378	3255	.....	.....	.....	.....	.....	17390
Intercolonial.....	4762	3109	.....	.....	.....	250	60676	.....	30430	583	116066
Marsh.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8121
Dominion.....	1614	7237	4182	560	.....	.....	.....	313	.....	.....	.....
Gowrie and Blockhouse.....	.....	.....	45138	13839	11700	77290	1240	69049	38850	3010	16916
Sydney Mines.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	257106
Indian Cove.....	6777	1000	.....	.....	.....	.....	.....	.....	.....	.....	7777
New Campbellton.....	.....	9741	.....	860	.....	.....	.....	.....	.....	.....	22056
Port Hood.....	8392	6564	27845	6000	9960	.....	8631	3424	.....	1000	59761
Mabou.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Broad Cove.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	\$2772	\$49670	\$31557	\$156979	\$27414	\$47283	\$146910	\$107299	\$53443	\$628041	\$628041

## COAL.

NOVA SCOTIA EXPORTED TO THE UNITED STATES

Years.	Tons.	Duty.	Years.	Tons.	Duty.
1850	118173	24 ad.	1877	118216	75
1851	116274	"	1878	88495	"
1852	87542	"	1879	51641	"
1853	120764	"	1880	123423	"
1854	139125	Free.	1881	113728	"
1855	103222	"	1882	99302	"
1856	126152	"	1883	102755	"
1857	123335	"	1884	64515	"
1858	186743	"	1885	34483	"
1859	122720	"	1886	66003	"
1860	149289	"	1887	73892	"
1861	204457	"	1888	30198	"
1862	192612	"	1889	29986	"
1863	282775	"	1890	50854	"
1864	347594	"	1891	25431	"
1865	465194	"	1892	13883	"
1866	404252	"	1893	16099	"
1867	338492	\$1.25	*1894	79837	40
1868	228132	"	†1895	73097	"
1869	257485	"	†1896	174919	"
1870	168180	"	1897	106279	67
1871	165431		1898	98027	"
1872	154092	75	1899	153188	"
1873	254760	"	1900	624273	"
1874	138336	"	1901	590086	"
1875	89746	"	1902	751382	"
1876	71634	"	1903	968832	"

NOTE.—The quantities given for the years 1852 to 1872 are on the authority of the Board of Trade, Philadelphia, and are probably under-estimated.

\*Nine months only.

†NOTE.—After August 1st, 1894, duty on Round Coal 40 cents, on Culm or Slack, 15 cents.

‡Fiscal year begins October 1st, and ends Sept. 30th. (Cap. 4, Acts 1893).

||On July 24th, 1897, the duty was made 67 cents.

## NOVA SCOTIA COAL SALES, 1785 TO 1903 (INCLUSIVE).

Year.	Sales.	Total.	Year.	Sales.	Total.
1785	1,668		1841	148,298	
1786	2,000		1842	129,708	
1787			1843	105,161	
1788	10,681		1844	108,482	
1789			1845	150,674	
1790			1846	146,506	
		14,349	1847	201,650	
1791	2,670		1848	187,613	
1792	2,113		1849	174,592	
1793	1,926		1850	180,084	
1794	4,405		1851	153,499	
1795	5,320		1852	188,076	
1796	5,249		1853	217,416	
1797	6,039		1854	234,812	
1798	5,948		1855	238,215	
1799	8,947		1856	253,492	
1800	8,401		1857	294,198	
		51,048	1858	226,725	
1801	5,755		1859	270,293	
1802	7,769		1860	322,593	
1803	6,601		1861	326,429	
1804	5,976		1862	395,637	
1805	10,130		1863	429,331	
1806	4,938		1864	576,935	
1807	5,119		1865	635,186	
1808	6,616		1866	558,520	
1809	8,919		1867	471,185	
1810	8,609		1868	453,624	
		70,452	1869	511,795	
1811	8,516		1870	568,277	
1812	9,570		1871	596,418	
1813	9,741		1872	785,914	
1814	9,866		1873	811,106	
1815	9,336		1874	749,127	
1816	8,619		1875	706,795	
1817	9,284		1876	634,207	
1818	7,920		1877	697,655	
1819	8,692		1878	693,511	
1820	9,930		1879	688,628	
		91,527	1880	934,659	
1821	11,308		1881	1,035,014	
1822	7,512		1882	1,250,179	
1823			1883	1,297,523	
1824	27,000		1884	1,261,650	
1825			1885	1,254,510	
1826	12,600		1886	1,373,666	
1827	12,149		1887	1,519,684	
1828	20,967		1888	1,576,692	
1829	21,935		1889	1,755,107	
1830	27,269		1890	1,786,111	
		140,820	1891	1,849,945	
1831	37,170		1892	1,752,934	
1832	50,369		*1893	1,435,914	
1833	64,743		†1894	2,019,742	
1834	50,813		1895	1,831,357	
1835	56,434		1896	2,047,133	
1836	107,593		1897	2,013,421	
1837	118,942		1898	2,135,397	
1838	106,730		1899	2,119,137	
1839	145,962		1900	2,997,546	
1840	101,198				
		839,954	1901	3,119,335	
			1902	3,898,626	
			1903	4,621,074	
			Total....		20,552,526
					11,639,035

## SUMMARY.

1785 to 1790.....	14,349	1841 to 1850 .....	1,533,798
1791 to 1800.....	51,048	1851 to 1860 .....	2,399,319
1801 to 1810.....	70,452	1861 to 1870 .....	4,927,339
1811 to 1820.....	91,527	1871 to 1880 .....	7,317,430
1821 to 1830.....	140,320	1881 to 1890 .....	13,919,136
1831 to 1840.....	839,954	1891 to 1903 .....	32,191,561

\*Nine months only. †Fiscal year begins Oct. 1st and ends Sept. 30th. (Chap. 4, Acts 1893.)

## PRODUCTION OF GOLD FROM 1862 TO 1903.

DISTRICT.	TONS CRUSHED.	TOTAL YIELD OF GOLD.			AVERAGE YIELD OF GOLD PER TON.			VALUE \$19.00 PER OZ.
		Oz.	Dwts.	Gr.	Oz.	Dwts.	Gr.	
Caribou and Moose River .....	154500	50247	16	5	.....	6	12	\$954709
Montague .....	27238	41322	16	18	.....	10	8	785134
Oldham .....	50655	53933	1	15	1	1	7	1024728
Renfrew .....	50936	44770	2	19	.....	17	14	8506333
Sherbrooke .....	278820	149437	4	18	.....	10	18	2839307
Stormont .....	265146	81980	16	9	.....	6	4	1557636
Tangier .....	50322	23895	4	15	.....	9	10	454009
Uniacke .....	60584	42362	17	23	.....	14	0	804895
Waverly .....	155520	69978	6	1	.....	9	0	1329588
Brookfield .....	69563	30277	3	23	.....	8	17	575267
Salmon River .....	117906	41497	5	20	.....	7	1	788448
Whiteburn .....	6588	9638	14	18	1	9	6	183136
Lake Catcha .....	26571	26173	4	21	.....	19	17	497292
Rawdon .....	12189	9606	5	10	.....	15	18	182519
Wine Harbor .....	62821	31428	3	1	.....	10	0	597135
Fifteen Mile Stream .....	36456	17058	15	5	.....	9	8	324116
Malaga .....	20896	19293	11	7	.....	18	11	366577
Other Districts .....	107597	61971	2	18	.....	11	13	1177452
Totals .....	1554308	804872	14	6	.....	10	9	\$15,292,581

## GENERAL GOLD STATEMENT.

Year Ended Sept. 30th, 1903.

## MINES REPORT.

DISTRICT.	TONS CRUSHED.	TOTAL YIELD OF GOLD.			AVERAGE YIELD OF GOLD PER TON.		
		Oz.	Dwt.	Gr. s.	Oz.	Dwt.	Gr. s.
Stormont.....	20331	3094	1	12	12	12	1
Sherbrooke.....	19221	3820	12	12	...	...	3
Renfrew.....	610	1717	2	12	2	16	7
Wine Harbor.....	4048	1412	8	11	...	6	23
Leipsigate.....	7861	2009	18	9	...	5	3
Harrigan Cove.....	1613	1091	10	15	...	13	12
North Brookfield.....	10143	2872	11	0	...	5	16
Waverly.....	7795	1853	14	16	...	4	18
Caribou.....	11961	3653	3	8	...	6	3
Oldham.....	712	419	8	23	...	11	19
Uniacke.....	1390	893	2	22	...	12	20
Lake Catcha.....	677	472	11	8	...	13	23
Kemptville.....	411	205	13	0	...	10	0
Other Districts.....	5872	1682	5	14	...	5	18
Total.....	92645	25198	4	18	...	5	11

MONTHLY STATEMENT FOR EACH GOLD DISTRICT.

MONTH.	STORMONT.			YIELD OF GOLD.			YIELD OF GOLD.			
	No. of Mines.	Tons Crushed.	Oz.	Dwt.	Grs.	No. of Mines.	Tons Crushed.	Oz.	Dwt.	Grs.
October.....	3	2856	618	5	12	2	1369	524	.....	.....
November.....	2	2915	483	.....	.....	2	1558	529	6	6
December.....	2	2685	329	6	.....	2	1949	540	4	4
January.....	2	2206	485	.....	.....	2	2293	400	.....	.....
February.....	2	880	281	14	.....	2	1469	231	4	4
March.....	1	370	136	12	.....	1	950	78	.....	.....
April.....	1	325	95	4	.....	1	452	55	.....	.....
May.....	1	320	116	15	.....	2	2303	197	8	12
June.....	1	320	119	.....	.....	2	1566	374	1	1
July.....	1	327	94	8	.....	2	1716	353	7	7
August.....	1	286	52	.....	.....	2	1945	331	17	17
September.....	3	6741	282	17	.....	2	1651	206	5	5
Total.....		20331	3094	1	12		19221	3820	12	12

MONTHLY STATEMENT FOR EACH GOLD DISTRICT.—(Continued.)

MINES REPORT.

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MONTH.	RENFREW.			WINE HARBOR.					
	No. of Mines.	Tons Crushed.	YIELD OF GOLD.	No. of Mines.	Tons Crushed.	YIELD OF GOLD.			
	Oz.	Dwt.	Grs.	Oz.	Dwt.	Grs.			
October.....	1	35	152	10	....	1	250	61	....
November.....	2	149	313	7	....	1	250	63	....
December.....	1	31	5	5	12	3	397	157	....
January.....	1	65	290	....	....	2	355	105	12
February.....	1	50	206	....	....	2	355	104	13
March.....	1	40	193	....	....	2	363	111	3
April.....	1	35	156	....	....	2	350	122	....
May.....	1	50	210	....	....	3	270	70	10
June.....	1	50	Crushing.	....	....	3	397	199	10
July.....	1	40	96	....	....	3	446	126	4
August.....	1	65	39	....	....	3	230	133	7
September.....	1	65	56	....	....	3	385	159	....
Total.....	610	1717	2	12	....	4048	1412	8	11

## MONTHLY STATEMENT FOR EACH GOLD DISTRICT.—Continued.

Month.	*LEPSIGATE.			HARRIGAN COVE.		
	No. of Mines.	Tons Crushed.	YIELD OF GOLD. Oz. Dwt. Grs.	No. of Mines.	Tons Crushed.	YIELD OF GOLD. Oz. Dwt. Grs.
October .....	1	50	47 ..... No Crushing.	1	110	93 ..... 117
November .....	.....	.....	..... No Crushing.	1	117	10 ..... 129
December .....	.....	.....	..... No Crushing.	2	107	5 ..... 124
January .....	1	400	175 8 9 127 10 .....	1	113	15 ..... 85
February .....	1	286	127 .....	1	118	10 ..... 101
March .....	1	400	196 .....	1	93	..... 96
April .....	1	322	60 5 .....	2	163	..... 121
May .....	2	475	178 10 .....	1	95	..... 82
June .....	1	2348	540 14 .....	2	155	5 ..... 30
July .....	1	1231	326 .....	2	125	5 ..... 65
August .....	1	797	64 11 .....	2	202	10 ..... 79
September .....	1	1452	294 .....	2	215	5 ..... 84
Total .....	7861	2009	18 9 .....	1613	1091	10 15

\*LEPSIGATE.—Of 7811 tons mentioned as crushed, 3305 tons were tailings treated by Cyanide Process.  
Mint returns show that the gold from the 7811 tons above mentioned contained 231 ozs., 12 dwt., 19 grs. of silver.

## MINES REPORT.

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MONTHLY STATEMENT FOR EACH GOLD DISTRICT.—(Continued.)

## MONTHLY STATEMENT FOR EACH GOLD DISTRICT.—Continued.

MONTH.	North Brookfield.			Waverly.						
	No of Mines.	Tons Crushed.	YIELD OF GOLD.			No. of Mines.	Tons Crushed.	YIELD OF GOLD.		
			Ozs.	Dwt.	Gr.			Ozs.	Dwt.	Gr.
October .....	1	807	336	.....	.....	2	1039	318	13	16
November .....	1	1067	163	.....	.....	2	911	293	13	18
December .....	1	788	187	.....	.....	2	585	136	10	.....
January .....	1	690	264	11	.....	1	820	240	.....	.....
February .....	1	1190	163	7	.....	1	850	185	15	.....
March .....	1	874	272	.....	.....	2	936	221	11	.....
April .....	1	838	283	.....	.....	1	781	187	10	.....
May .....	1	974	183	.....	.....	1	10	3	1	.....
June .....	1	702	281	.....	.....	2	1640	165	5	.....
July .....	1	858	237	18	.....	3	223	Crushing.		
August .....	1	670	257	15	.....			101	15	6
September .....	1	685	244	.....	.....			7795	1853	14
Total .....		10143	2872	11	.....					16

## MONTHLY STATEMENT FOR EACH GOLD DISTRICT.—(Continued.)

## MINES REPORT.

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Month.	UNIACKE.			LAKE CATCHA.						
	No. of Mines.	Tons Crushed.	YIELD OF GOLD.			No. of Mines.	Tons Crushed.	YIELD OF GOLD.		
			Oz.	Dwt.	Grs.			Oz.	Dwt.	Grs.
October.....	4	333	156	12	22	2	127	92	15	14
November.....	3	193	125	8	....	2	170	123	17	19
December.....	1	15	5	4	....	2	97	76	18	1
January.....	2	210	148	6	2	2	68	43	1	15
February.....	1	76	80	10	....	2	70	42	10	7
March.....	1	40	21	16	....	1	20	13	12	....
April.....	1	35	15	17	....	1	4	4	10	....
May.....	1	96	101	15	....	1	26	15	18	11
June.....	3	29	26	10	16	2	45	30	12	13
July.....	2	105	73	10	....	2	36	13	1	....
August.....	2	152	74	18	6	1	5	2	14	....
September.....	2	106	62	15	....	1	9	13	0	....
Total.....	.....	1390	893	2	22	.....	677	472	11	8

## MONTHLY STATEMENT FOR EACH GOLD DISTRICT.—(Continued.)

MONTH.	KEMITVILLE.			Oruier Districts.		
	No. of Mines.	Tons. Crushed.	YIELD OF GOLD. Oz. Dwt. Grs.	No. of Mines.	Tons. Crushed.	YIELD OF GOLD. Oz. Dwt. Grs.
October...	1	175	97 5 .....	3	552	181 4 12
November.....	1	100	46 15 .....	3	450	222 17 .....
December.....	1	75	33 .....	2	123	36 7 16
January.....	No	Crushing.		3	129	45 4 3
February.....	No	Crushing.		3	2250	611 10 .....
March.....	No	Crushing.		3	243	98 11 1
April.....	1	24	12 15 .....	3	300	108 1 .....
May.....	No	Crushing.		2	195	36 2 .....
June.....	1	12	5 15 .....	2	128	22 16 .....
July.....	1	25	10 3 .....	1	110	27 8 .....
August.....	No	Crushing.		4	678	130 2 6
September.....	No	Crushing.		4	714	162 2 .....
Total.....	411	205	13 .....	.....	5872	1682 5 14

## MINES REPORT.

INTERCOLONIAL RAILWAY.

*Statement showing the various kinds of coal received from the different mines in Nova Scotia for use of the Intercolonial Railway from October 1st, 1902, to September 30th, 1903.*

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INTERCOLONIAL RAILWAY.

*Statement showing the number of Tons of Coal received at the following stations from mines in Nova Scotia during the year ended 30th September, 1903..*

Destination.	Tons.	Destination.	Tons.
Halifax .....	81396	Brought forward...	419950
Dartmouth .....	20543	Point Tupper .....	125
Waverly .....	340	Hawkesbury .....	14
Rockingham.....	80	McIntyre's Lake .....	13
Bedford .....	830	Cleveland .....	13
Windsor Junction. ...	21026	West Bay Road .....	21
Wellington .....	21	River Denys.....	20
Enfield .....	183	Orangedale .....	127
Elmsdale .....	733	Iona .....	654
Milford .....	14	Grand Narrows .....	252
Shubenacadie .....	242	Christmas Island.....	73
Stewiacke. . ....	298	Shenacadie .....	13
Brookfield.....	336	Boisdale .....	71
Truro .....	17485	Long Island.....	111
Valley .....	16	Barrachois .....	61
West River .....	34	George's River.....	399
Glengarry.....	14	Scotch Lake.....	218
Hopewell .....	1518	North Sydney .....	60
Ferrona Junction.....	38852	Leitche's Creek .....	54
Stellarton .....	10516	Sydney River .....	247
Westville .....	69	Debert .....	20
Sylvester's .....	273	East Mines .....	55
New Glasgow .....	10506	Londonderry .....	10300
Trenton .....	88014	Oxford .....	1542
Pictou Landing .....	122826	Pugwash .....	1608
Merigomish .....	139	Wallace Bridge .....	21
Avondale .....	78	Wallace .....	400
James River.....	7	Batty's Siding .....	85
Antigonish .....	3561	Malagash .....	102
South River .....	7	Tatamagouche .....	409
Pomquet .....	8	Denmark .....	185
Heatherton .....	42	Urquhart's .....	14
Bayfield .. ....	25	River John .....	479
Tracadie .. ....	47	Wilson's .. ....	77
Har. au Bouche .....	54	Meadowville .. ....	27
Mulgrave .. ....	897	Scotsburn .. ....	147
<i>Carried forward...</i>	421030	<i>Carried forward...</i>	438977

## INTERCOLONIAL RAILWAY—(Continued.)

Destination.	Tons.	Destination.	Tons.
<i>Brought forward...</i>	438977	<i>Brought forward...</i>	611098
Scotch Hill .....	320	Rimouski.....	379
Haliburton's.....	21	Cacouna.....	20
Pictou .....	12116	River du Loup.....	6147
Athol.....	14	St. Paschal.....	21
Macean .....	7	St. Denis Wharf .....	219
Nappan.....	17	St. Anne.....	22
Amherst.....	29494	L'Islet.....	16
Aulac .....	178	Montmagny .....	76
Sackville .....	6414	St. Charles Junction..	90
Dorchester .....	2112	St. Henri Junction...	27485
College Bridge.....	1253	Chaudiere Junction...	74
Memramcook .....	127	Levis.....	5611
Shediac .....	1032	Villeroy.....	719
Point du Chene .....	281	St. Hyacinthe.....	6845
Moncton .....	18390	St. Madeline.....	37
Salisbury .....	2633	Beloeil .....	929
Petitcodiac .....	656	St. Hubert.....	24
Sussex .....	1349	St. Lambert.....	1225
Apohaqui .....	7	Montreal.....	56666
Norton.....	508	G.T.R. via Chaudiere.	6209
Bloomfield.....	8	" " Montreal...	10818
Hampton .....	518	" St. Hyacinthe	115
Nauwigewauk.....	7	C.P.R. " Ste. Rosalie	2521
Rothesay .....	259	" " St. John....	5462
Coldbrook.....	77		
St. John.....	77224	Total.....	742828
Kent Junction .....	367		
Rogersville.....	36		
Chatham Junction.....	10860	SUMMARY.	
Chatham.....	516	FROM	TONS.
Millerton.....	160		
Derby Junction .....	173	Stellarton.....	239928
Newcastle.....	66	Westville.....	24649
Gloucester Junction..	1810	New Glasgow.....	111917
Bathurst.....	365	Albion.....	68735
New Mills.....	17	North Sydney.....	47463
Dalhousie .....	326	Sydney.....	11061
Campbellton .....	102	Springhill Junction...	151000
Moffats.....	16	Macean .....	60640
Matapedia.....	2285	Point Tupper.....	27435
<i>Carried forward...</i>	611098	Total.....	742828

## MINES REPORT.

## LABOR, LONDONDERRY IRON MINES.

## ABOVE GROUND.

SKILLED LABOR.	UNSKILLED LABOR.	DAYS' LABOR.
20	20	12,000

## UNDERGROUND.

59	60	11,500
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## LABOR, TOBROOK IRON MINES.

## ABOVE GROUND.

SKILLED LABOR.	UNSKILLED LABOR.	DAYS' LABOR.
8	6	1,837

## UNDERGROUND.

9	14	3,187
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## CUSTOMS CANADA.

## PORT OF WINDSOR.

*Memo. of Minerals exported during year ending September 30th, 1903.*

	TONS	VALUE
Outport of Cheverie, Gypsum .....	17,114	\$9,141
" Walton, " .....	6,415	3,829
Port of Windsor, " .....	146.835	146,835
Total Gypsum .....	170,364	159,805
Windsor moulding sand.....	240	960
Grand total (Port of Windsor, N. S.)...	170,604	\$160,765





PROVINCIAL EXHIBITION.

1903.

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# ECONOMIC MINERALS

OF

## NOVA SCOTIA.

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### CATALOGUE AND DESCRIPTION.

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DEPARTMENT OF PUBLIC WORKS AND MINES.



HALIFAX, N. S.:  
THE COMMISSIONER OF PUBLIC WORKS AND MINES,  
KING'S PRINTER.  
1903.



## NOVA SCOTIA' MINERALS.

The following brief notes are prepared to accompany the exhibit of Nova Scotia minerals made for the Provincial Exhibition, held at Halifax, September, 1903. Lack of time has prevented as full an exhibit as would be desirable, but it is trusted that it will show the general characters of the better known mineral deposits.

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### COAL.

#### CAPE BRETON COAL FIELDS.

Nova Scotia coal is bituminous, and in many cases coking, resembling the coals of the north of England.

In the counties of Inverness and Victoria there are collieries at New Campbellton, Port Hood, Mabou and Broad Cove, working important deposits of coal. These mines, recently opened, are rapidly increasing their output and will soon produce an important percentage of the provincial sales. The coals are abundant in this part of Cape Breton and of good quality, and close to tide water.

The Sydney coal field in the county of Cape Breton has been long known for its excellent steam coals, which are largely used for domestic purposes, coke, gas making, etc. The area of the field, which is not yet fully explored, is about 400 square miles. It contains a number of large seams favorably situated for mining, and is on tide water.

**BITUMINOUS COAL.** Phalen Seam, Dominion Coal Co's collieries, Glace Bay, C. B. Co.—This company is too well known to require more than a brief account of it and its operations. It operates under a lease of 99 years, the royalty to the N. S. Government for the whole period being fixed at a minimum of  $12\frac{1}{2}$  cents per ton, with a minimum gross amount for each year to be paid on at least as many tons as were in 1891 sold by all the mines included in the new company. It has control of the Glace Bay section of the Sydney coal field, where it works the Phalen (8 ft.) and Harbor (6 ft.) seams on a large scale. The following collieries are in operation: Caledonia (Phalen seam), International (Phalen seam), Reserve (Phalen seam), and Dominion Nos. 1 (Phalen seam), 2 (Harbor and Phalen seams), 3 (Phalen seam) and 4. These collieries are up to date in every respect, the pits being supplied with all modern improvements in the way of endless haulage, compressed air for pumps and mechanical coal-cutters, fans, picking tables, etc., and

there are also 3 Robinson-Ramsey coal washers, with a combined capacity of 2,000 tons daily. The company's railway connects the mines with the I. C. Railway, the Dom. Steel Co's furnaces, and shipping piers at Sydney Harbour and Louisburg (40 miles of main track). The monthly output for 1902 of Caledonia colliery was 58,000 tons; of International, 25,000; Reserve, 65,000; Dominion No. 1, 60,000. The total output of all the collieries for 1902 was 3,174,227 tons, of which 2,912,311 were shipped. All the seams are worked "room and pillar." The following analyses show the character of the seams of this district:—

	Emery.	Gowrie.	Phalen.	International.
Moisture . . . . .	.64	.50	.52	.80
Volatile combustible matter . . .	31.10	28.13	34.21	27.55
Fixed carbon . . . . .	63.10	66.01	59.73	65.90
Sulphur . . . . .	1.51	1.75	.81	1.45
Ash . . . . .	3.65	5.36	3.92	4.30

The Phalen seam yields 11,012 cubic ft. of gas per long ton, having an average calorific power of 571.85 B. T. U. and an average illuminating power of 9.9 candles, and with a Welsbach burner 54.34 candles. The total yield of coke was 74.68 per cent.; the ammonium sulphate per ton amounted to 32.91 lbs.; the tar, 12.89 gals; and the benzole .103 gals.

**COKE.** Made from Dominion Coal Co's coal, at Dominion Iron and Steel Co's ovens, Sydney, C. B. Co.

**BITUMINOUS COAL.** N. S. Steel & Coal Co.'s colliery, Sydney Mines, C. B. Co.—The Point Aconi and Sydney Mines areas of this company consist of 11,709 acres, which contained in 1871, according to the estimate of R. Brown, 155,000,000 tons of coal; and the Sydney Mines submarine areas of 3,200 acres, which contained in 1871, according to the same authority, 66,000,000 tons of coal. Since that date about 5,000,000 tons have been mined from these areas. The main seam at Sydney Mines is 5 ft. 4 in. thick and is opened by a shaft 690 ft. deep. The workings now extend far beneath the sea, the cover there now being about 1,000 ft. of strata. The company is now opening up two new mines, known as Sydney No. 1 and Sydney No. 2. Slopes have been driven on the former 1,650 ft., and in the latter, 850 ft. The colliery is well equipped and the average output for past four years has been nearly 270,000 tons per annum. The coal is excellent for house use and makes good coke. The following analyses will serve to show the character of the main seam:

Moisture . . . . .	1.536
Volatile combustible matter . . . . .	36.362
Fixed carbon . . . . .	37.008
Sulphur . . . . .	1.894
Ash . . . . .	5.084

**BITUMINOUS COAL.** Gowrie Seam, Gowrie and Blockhouse collieries, Port Morien, C. B. Co.—This company is the successor of the coal syndicate of Newcastle-on-Tyne, and the royalties acquired cover about 8 square miles, embracing several seams of importance. A shaft 205 feet deep has been sunk to the Gowrie seam, and the coal proven to be 5 ft. 2 in. thick and of excellent quality. The shaft level has been driven in and a "stone drift" set away to the new workings, seven acres in extent. On completion endless haulage will be installed. Output in 1902 was 19,597 tons, 14,880 of which were sold.

**BITUMINOUS COAL.** Cape Breton Coal Mining Co's Colliery, New Campbellton, C. B. Co.—Coal was worked here as early as 1861, but the present owners acquired the property (area of 3 miles), in 1893. A 4 ft. seam is worked; dip, 12°; opened by a slope, 1,800 ft.; worked "pillar and room." Ingersoll coal-cutting machines are used. The colliery is connected by a 3 ft. gauge railway, 1½ miles long, with the shipping wharf at the mouth of the Big Bras d'Or Lake. The output for 1902 was 12,838 tons, of which the colliery consumption was 3,083 tons. The chief market is in Nova Scotia and Newfoundland.

**BITUMINOUS COAL.** So-called "Conglomerate Seam," Cochran Lake, C. B. Co.—This seam is being prospected by Rev. Mr. Murray. It is peculiar as having a roof of conglomerate.

**BITUMINOUS COAL.** "No. 3" or "Indian Cove" Seam, Sydney Coal Co., Indian Cove, Sydney Mines, Cape Breton Co.—The seam worked here measures 4 ft. 6 in. in greatest thickness, and is near the base of the coal measures as defined by the geological survey. The coal is won by a tunnel driven on the strike 2,400 feet. Natural drainage and ventilation. Average yearly output about 8,000 tons (of 2240 lbs.) The haulage is by tail-rope system. This seam is said to have been worked by the French in the early history of the province.

**BITUMINOUS COAL** (screened, stove and pea size). Port Hood Coal Co's Colliery, Port Hood, Inver. Co.—This company owns and is opening up a coal property comprising 16 square miles at Port Hood. The company's slope, known as the "Lawson slope," is being worked at a depth of about 700 ft. The seam is 6 ft. 11 in. thick, and is entirely free from slate bands and partings.\* An estimate places the amount of coal contained in two of the company's seams, at 160,000,000 long tons. Other seams exist on the property and will be eventually developed. With the introduction of more modern machinery, an output of from 500 to 1000 tons per day is expected. Output for 1902, 45,900 tons, of which sales and shipments were 39,008 tons.

**BITUMINOUS COAL.** Inverness Railway and Coal Co's. Colliery, Broad Cove, Inverness Co.—This company has under development some 45,000 acres of areas contiguous to railway. The operations

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\*An analysis of the coal is as follows:—Moisture, 3.85; volatile matter, 35.60; fixed carbon, 53.50; sulphur, 2.849; ash, 7.05.

of the company during 1902 were largely confined to development, installation of additional plant, construction of shipping pier, etc., but during the year 38334 tons of coal were produced and 23027 tons sold. Average thickness of seam worked, 7 ft.; length of slope No. 1 is 1,366 feet. Eight seams are reported in this district running in thickness from 2 ft. to 12 ft.

#### THE PICTOU COUNTY COAL FIELD.

This district, situated at New Glasgow, has, so far as exploratory work has been carried, an area of about 35 square miles. Work now being done is expected to show that the seams of this district extend as far as the town of Pictou, giving it an area of many hundred square miles. There are a number of collieries here operated by the Nova Scotia Steel and Coal, the Acadia, and the Intercolonial Companies. The coal is used for the same purposes as that from the Sydney coal field.

**BITUMINOUS COAL** (lump, stove and nut sizes). Main Seam, Intercolonial Coal Co.'s. Drummond Colliery, Westville, Pictou Co.—The coal areas of this company comprise  $7\frac{3}{4}$  sq. miles. The main and second seams are worked, the third and fourth being intact. The second seam is only being opened up. There are two slopes, average dip  $16^\circ$ , length 6,300 ft., one of which is used for hoisting coal, the other for lowering and raising men, etc. The seam is worked on the long-wall system and no explosives are used, the coal being brought down by maul and wedge. The company also have 20 bee-hive coke ovens, with a Robinson coal washer. During the year 1902, 216,180 tons of coal were raised, of which 191,560 were shipped and 4,685 tons of coke made. The chief markets are in Nova Scotia, Quebec and Prince Edward Island. The "main seam" (which is also worked by the neighboring Acadia colliery) has been analyzed with the following result:

Moisture .....	1.52
Volatile combustible matter .....	29.46
Fixed carbon .....	60.19
Ash .....	9.10
Sulphur .....	1.62
Theo. evaporative power.....	8.24

**BITUMINOUS COAL.** Acadia Coal Co.—This company owns 16 sq. miles of areas, and has the following well-known collieries: Acadia at Westville (seam 10 ft., dip  $27^\circ$ , slope 4,550 ft. long), and the Albion at Stellarton (noted for the thickness of its seams—the Main being 38 ft., and 148 ft. lower, the Deep, 22 ft. thick, also the Third and McGregor). The latter colliery includes the Foord Pit on Main seam, used since the explosion as a pumping station. No. 11 Slope, on Third Seam, is 2,800 ft. long, dip  $22^\circ$ , (Cage Pit or Deep Seam worked from this slope); and the McGregor slope, seam 15 to 20 ft., slope 4,500 ft. to bottom of basin. The Vale Colliery is 6 miles east of New Glasgow, slope 2,400 ft. long on the

Six Foot Seam. The various collieries have a large plant and are connected with the I. C. Railway. The company also manufactures coke. The total output for 1902 was 319,123 tons, of which 278,838 were sold; coke made, 7,411 tons. Chief markets,—Nova Scotia, Quebec and United States. The coals of the Pictou district are less bituminous than those of Cape Breton. They are good steam coals and well adapted for use in iron works, etc., and are largely used for domestic fuels. The following analyses will give an idea of their composition:—

	Acadia.	Deep.
Moisture .....	2.10	.75
Volatile combustible matter .....	29.20	20.34
Fixed carbon .....	61.15	68.50
Ash .....	7.55	10.41
Sulphur .....	1.48	.94
Theo. evaporative power .....	8.50	9.39

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#### CUMBERLAND COUNTY COAL FIELD, ETC.

This large and still partly unexplored district probably covers about 350 square miles. The principal operations are at Springhill, where the Cumberland Coal and Railway Company operates mines yielding between four and five hundred thousand tons a year. Smaller collieries are found extending from the Joggins to the Styles mines, a distance of about 20 miles. The coals are bituminous and coking, and are largely used on locomotives in the lower provinces.

Coal beds are known at many other localities, but not worked except at DeBert, near Truro, where a mine is being opened.

Cannel coal, oil-shales, etc., occur in the different districts, but as yet have received little attention.

**BITUMINOUS COAL.** Cumberland Railway & Coal Co., Springhill, Cumb. Co.—At Springhill, 3 seams from 6 to 14 ft. in thickness are extensively worked, the output for 1902 being 480,676 tons, of which 401,777 were sold. Chief markets are New Brunswick, United States and Nova Scotia. The colliery is well equipped with modern appliances. No. 2 slope is 3,000 feet in length and works a seam 10 ft. 6 in. thick, and No. 3 is 3,200 ft. and works a 10 ft. seam. Coal shipments are made via Springhill Junction (I. C. R) and by vessels from Parrsboro. The coal has the following general analysis:—

Volatile combustible matter .....	28.85
Fixed carbon .....	62.78
Moisture .....	3.66
Ash .....	4.32
Sulphur .....	1.26
Theo. evaporative power .....	8.69

**BITUMINOUS COAL.** Scotia Colliery, Maccan, Cumberland Co.—This mine, which is owned by Messrs. Ripley and Blenkhorn, raised in 1902 with a small plant 493 tons of coal, of which 423 were sold.

**BITUMINOUS COAL.** Maritime Coal Co's "Chignecto Mine," Chignecto, Cumberland Co.—This colliery was re-opened in 1902, and after some initial trouble the mine was unwatered and put in order. At the bottom of the slope, which was in 1902 about 600 feet deep, the top coal measures 3 ft. 6 in., and the bottom coal measures 5 ft. 6 in., separated by 1 ft. 3 in. of fire-clay. There is a third seam of good coal 2 ft. 6 inches thick, overlying what is termed the top coal, which has not been worked. It is separated from the top coal by 4 ft. of fire-clay. The company intend sinking continuously until it reaches 1,400 ft. from the surface. The output in 1902 was 2243 tons, of which the sales were 690 tons, but it is doubtless much heavier this year.

**BITUMINOUS COAL.** Minudie Coal Co's Colliery, River Hebert, Cumberland Co.—This company's areas comprise about 314 acres at River Hebert, opened by two slopes equipped with a working plant capable of producing about 500 tons per day.

**BITUMINOUS COAL.** Milner Seam, Strathcona Coal Co's Colliery, River Hebert, Cumberland Co.—This colliery has now a slope of over 460 ft. The coal is reported to be improving in quality with depth. New bankhouse, screens, and engine house have recently been built; 2100 tons of coal were raised in 1902, and 1820 tons sold.

**BITUMINOUS COAL.** Strathcona Seam, Strathcona Coal Co's Colliery, River Hebert, Cumberland Co.—This is from a seam just discovered on the company's property, and the sample shown is from close to the surface, out of a trial pit. The seam is 3 ft. 6 ins. thick with 2 ins. clay parting in centre.

**BITUMINOUS COAL.** Canada Coals and Ry. Co's "Joggins Colliery," Joggins, Village, Cumberland Co—This company controls an area of 12 sq. miles. Colliery connected by rail with I. C. Ry., and a shipping wharf on Chignecto Bay. Seam from 4 to  $5\frac{1}{2}$  ft. thick; dip 17°; slopes, 2700 and 2500 ft. respectively. The output for 1900 was 52,309 tons, 12,223 tons of this being used by employees. The coal is chiefly marketed in New Brunswick and Quebec. The following analysis of Joggins coal was made by Sir J. W. Dawson:

Moisture . . . . .	2.50
Volatile combustible matter . . . . .	36.30
Fixed carbon . . . . .	56.00
Ash . . . . .	5.20

**BITUMINOUS COAL.** Areas of Dr. J. H. McKay and others, Upper Kemptown, Col. Co.—Various croppings of coal are known in this district. Fifty years ago or more a pit was sunk on one of these seams and a quantity of coal mined and sold throughout the country.

The Kemptown coal slope, put down for Dr. McKay and associates is down 130 feet on the incline (being about 70 feet vertical), timbered throughout, with haulage-way and pump-gear compartment. A borehole at depth of 150 feet is said to have shown 5 feet, and one at 183 feet., 6 feet. of coal, which it is proposed to win by the sinking of the present slope. Union station on the I. C. R., is 5 miles distant. Six seams of coal have so far been reported on the 23 sq. miles of areas controlled by this company.

**BITUMINOUS COAL.** DeBert Mountain, Colchester Coal & Ry. Co., Col. Co.—The sample shown is from about 23 ft below the surface, from a seam 6 ft. 2 in. thick, 20 inches of which is fire-clay. The company is putting down two slopes, one being 100 ft. and the other 205 ft.

**CANNEL COAL.** Rev. M. A. McPherson's lease, near North Sydney Harbor, C. B. Co.—The seam from which this was taken is said to be  $2\frac{1}{2}$  ft. thick.

The following tables will show the trade by counties, and the production by companies for the year ended September 30, 1902:—

## COAL TRADE BY COUNTIES FOR THE YEAR ENDED SEPTEMBER 30TH, 1902.

	CUMBERLAND.	PICTOU.	CAPE BRETON.	OTHER COUNTIES.	TOTAL.
Nova Scotia:					
By land .....	107469	228146 21320	231857 750851	13144 29176	580616 801947
By sea .....	.....				
Total.....	107469	250066	982708	42320	1382563
New Brunswick .....	211647	30631 102	71544 102689	5516 2496	319338 105287
Newfoundland .....	.....	27470	23262	5471	56203
P. E. Island .....	59233	125185	1049930	9632	1243980
Quebec .....	.....	.....	5982	.....	5982
West Indies .....	74492	21929	654961	33891	751382 33891
United States .....	.....	.....	.....	.....	
Other Countries .....	.....	.....	.....	.....	
Total.....	452841	455383	2924967	65435	3898626

## COAL PRODUCE OF NOVA SCOTIA FOR YEAR ENDED SEPTEMBER 30TH, 1902.

COAL.

11

COLLIERY.	Produce.	Sales.	COLLIERY CONSUMPTION.	
			Engines,	Workmen.
Chignecto . . . . .	2243	690	1434	255
Joggins . . . . .	58027	46968	9341	2026
Jubilee . . . . .	1378	1163	115	...
Springhill . . . . .	480676	401777	31266	8875
Seota . . . . .	493	423	...	...
Strattonona . . . . .	2100	1820	225	48
Acadia . . . . .	286582	245278	35318	5789
Intercolonial . . . . .	206599	189183	15553	3871
N. S. Steel & Coal Co., (Pictou Co.)	22422	20922	1300	...
Dominion . . . . .	2952578	2715866	120064	28429
N. S. & C. Co., (Sydney) . . . . .	241891	186539	50093	8525
Gowrie & Block House . . . . .	19597	14880	3536	1120
Sydney Coal Co. . . . .	7493	7682	72	139
New Campbellton . . . . .	11939	9352	1775	1328
Port Hood . . . . .	34517	33056	3002	822
Broad Cove . . . . .	38334	23027	5920	408
				61635
	4366869	3898626	279014	279014

### GRAPHITE.

This mineral occurs in Cape Breton at Grand Narrows, Glendale, West Bay, East Bay, Hunter's Mountain, in the slates of the Nova Scotia gold fields, and at Musquodoboit, Hammonds Plains, etc.

These deposits appear in some cases to be well suited for the arts, but no attempt has been made to mine them.

**GRAPHITE.** Morrison's farm, French Vale, C. B. Co.—Owned by John A. McKenzie and others, of Sydney. So far has only been prospected. Surface material on analysis gave 39% graphite. See analysis in Report Geol. Survey of Canada.

**GRAPHITE.** H. F. McDougall's property, near Christmas Island, C. B. Co.—Awarded a diploma at the recent Paris and Glasgow exhibitions. The analysis is as follows:

Graphitic carbon.....	50.23
Rock matter .....	48.37
Water .....	6.50

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### OIL.

Indications of petroleum have been observed at Lake Ainslie in Cape Breton, and at Cheverie, Hants county, and some work done to test its presence in quantities of commercial value.

**PETROLEUM IN GYPSUM.** Burgess Bros. plaster quarry, Cheverie, Hants Co.—The presence at this vicinity of oil permeating the gypsum has been known for a number of years and has led many to think that a workable deposit of petroleum exists in connection with the underlying strata (shales), which are the equivalents of the oil-bearing Albert shales of New Brunswick. It remains to be proved if this is the case, or whether the petroleum which has been derived from these rocks has been able to pass off without accumulating in large deposits. During the present year extensive boring operations have been carried on at this place by the Nova Scotia Oil & Gas Co. A hole 1500 ft. deep failed to strike a deposit, but another hole is now being driven.

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### GOLD FIELDS.

The gold fields of Nova Scotia extend from Canso to Yarmouth, and cover, exclusive of the masses of intrusive granite, about 3,000 square miles. The labors of Mr. Faribault, of the Canadian Geological Survey, have presented us with maps and sections and descriptions of that part lying to the east of Halifax.

The gold field strata, originally horizontal, have been folded into numerous undulations having a general east and west course, and

north and south dips. In these undulations, interstratified with the rocks, are the gold-bearing quartz veins. These veins, owing to the denudation of the crests of the anticlinals or undulations, are seen in long elliptical outcrops, while underneath are similar veins not seen at all on the surface. Where these lower veins, untouched by denudation, pass over the axes of the anticlinals, they thicken, forming "saddle backs," due to the favoring conditions of the strata. The attention of our gold miners is at present directed to the problem of the best way of attacking and working these saddleback veins, and it is anticipated that, by their systematic exploration, gold mining in Nova Scotia will receive a long desired stimulus.

In addition to these intercalated veins there are others cutting the strata, which have been successfully worked.

Gold is plentiful in the surface earth of many districts. In many cases it should be washed or run through a crusher.

Nova Scotia gold having a fineness of over 900 parts, occurs as free gold in quartz with sulphides of various metals. It is extracted in stamp mills, and the residuum treated for the gold lost in the mills.

There are a number of districts scattered through the counties of Guysboro, Halifax, Hants, Colchester, Lunenburg, Queens and Yarmouth.

The following tables show the total yield of gold per district and the district yield for the year ended September 30th, 1902:—

## GENERAL GOLD STATEMENT YEAR ENDING SEPTEMBER 30TH, 1902.

DISTRICT.	TONS CRUSHED.	TOTAL YIELD OF GOLD,		AVERAGE YIELD OF GOLD PER TON.	
		OZ.	DWT.	GRS.	OZ.
Stormont .....	35906	6290	1	18	.....
Sherbrooke .....	15412	3720	9	.....	3
Renfrew .....	974	1374	11	1	4
Wine Harbour .....	4187	1186	2	.....	8
Leipsigate .....	2390	1135	2	14	5
Harrigan Cove .....	3445	1564	3	.....	9
North Brookfield .....	7736	3051	5	1	7
Waverley .....	11789	3049	14	.....	8
Caribou .....	9890	2162	.....	21	7
Oldham .....	719	565	10	.....	4
Uniacke .....	3896	1992	19	23	4
Lake Catcha .....	1037	554	8	11	5
Kemptville .....	515	389	17	.....	10
Other districts .....	4180	1243	.....	17	15
Total .....	192076	28279	5	13	5
					13

## PRODUCTION OF GOLD FROM 1862 TO 1902.

GOLD.

15

District.	Tons CRUSHED.	TOTAL YIELD OF GOLD,			AVERAGE YIELD OF GOLD PER TON.			\$	Value at \$19.00 per oz.
		Oz.	Dwt.	Gr.	Oz.	Dwt.	Gr.		
Caribou and Moose River . . . . .	142539	46594	12	21	.....	.....	6	13	\$ 885298
Montague . . . . .	27167	41309	10	18	1	10	10	10	784882
Oldham . . . . .	49943	53513	12	16	1	1	1	10	1016759
Renfrew . . . . .	50326	43053	.....	7	.....	17	3	3	818007
Sherbrooke . . . . .	259599	145616	12	6	.....	11	5	5	2766714
Strommont . . . . .	244815	78886	14	21	.....	6	11	11	1498848
Tanguis . . . . .	48122	23295	4	15	.....	9	16	16	442609
Uniacke . . . . .	59194	41469	15	1	.....	14	.....	.....	787926
Waverley . . . . .	147725	68124	11	9	.....	9	5	5	1294367
Brookfield . . . . .	59420	27404	12	23	.....	9	5	5	520688
Salmon River . . . . .	117906	41497	5	20	.....	7	1	1	788448
Whiteburn . . . . .	6583	9625	12	18	1	9	6	6	182887
Lake Catcha . . . . .	25894	25700	13	13	1	19	21	21	488313
Bawdon . . . . .	12189	9606	5	10	.....	15	18	18	182519
Wine Harbour . . . . .	58773	30015	14	14	.....	10	5	5	570299
Fifteen Mile Stream . . . . .	34876	16726	10	5	.....	9	14	14	317804
Magog . . . . .	20846	19282	1	7	.....	18	12	12	366359
Other Districts . . . . .	95746	57951	18	4	.....	12	3	3	1101087
	1461672	779674	9	12	.....	10	16	16	14813814

**AURIFEROUS QUARTZ.** Dolliver Mountain Mining and Milling Co., Isaac's Harbor.—This company's property, which is situated at Isaac's Harbor, N. S., includes a large water power and electrical plant, the first to be installed in the gold fields of the province.

**AURIFEROUS QUARTZ.** Bluenose Gold Mining Co., Sherbrooke.—This company is now opening up underlying saddle veins on the anticlinal.

**AURIFEROUS QUARTZ.** N. S. & Mexican Mining Co., Sherbrooke.—This company has recently installed a new plant, and is now sinking a vertical shaft from which the veins for a considerable distance across the measures will be developed.

**AURIFEROUS QUARTZ.** Royal Oak Mining Co., Sherbrooke.—The whole north-western turn of the anticlinal is being comprised in the operations of this company, which is now enlarging its milling capacity and plant.

**AURIFEROUS QUARTZ.** Baltimore & N. S. Mining Co., Caribou.—This company is working on a large ore-shoot said to be a fissure deposit. The workings have reached a vertical depth of over 800 feet.

**AURIFEROUS QUARTZ.** H. Sanders, Caribou.—This sample is from the above-mentioned property.

**AURIFEROUS QUARTZ AND SULPHIDES.** Austen Bros., Beaver Dam.—Though little developed, the district is said to contain some very wide belts of workable low grade ore.

**AURIFEROUS QUARTZ.** Austen Bros. et al., Blockhouse.—From new workings on a fissure vein.

**AURIFEROUS QUARTZ.** The Brookfield Mining Co., North Brookfield.—This company has been working since 1892. The average size of the vein worked is said to be about 14 inches, and it yields about \$17.00 per ton. The gold is saved partly by amalgamation and partly by concentration and chlorination.

**AURIFEROUS QUARTZ.** Golden Group Mining Co., Montagu.—This property, though worked for many years at a good profit, is at present idle.

**AURIFEROUS QUARTZ.** Mines Department,\* Montagu. From Belt Lode.

**AURIFEROUS QUARTZ.** Waverley Gold Mining Co., Waverley.—The specimens shown are from the famous barrel lead now being worked by the above company. Samples are also shown from the Mines Department collection.

**AURIFEROUS QUARTZ.** J. H. Townshend, Lawrencetown.—This property has recently been transferred to a stock company called the Shanghai Gold Mining Co.

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\*The specimens to which the Mines Department's name is affixed, are from the Department's collection in the Provincial Museum.

AURIFEROUS QUARTZ. MicMac Mining Co., Millipsigate.—This company took over above property about two years ago from Messrs Cashon & Hines, and has since been working continuously on the fissure vein, which has proved to be very persistent in size and general characteristics. A cyanide mill has recently been added to the property.

AURIFEROUS QUARTZ. Mines Department, Millipsigate.—From fissure vein.

AURIFEROUS QUARTZ. Mines Department, Cow Bay.—All the veins in this comparatively new district cut the strata at right angles, their strike being approximately north and south.

AURIFEROUS QUARTZ. Mines Department, Fifteen Mile Stream.

AURIFEROUS QUARTZ. W. C. Sarre, Gold River.—From the Vermilion Lead.

AURIFEROUS QUARTZ. Mines Department, Renfrew.—A system of some 50 interlaminated veins has been developed here on the south side of a broad anticlinal dome. Several of them have been opened along their outercrops and many important pay streaks have been worked to depths reaching 350 feet.

AURIFEROUS QUARTZ. Mines Department, South Uniacke.

AURIFEROUS QUARTZ. Messrs. Archibald and Crease, Mount Uniacke. These specimens are among the finest ever taken from a Nova Scotia mine. The property is situated about twenty-five miles from Halifax and three miles from a railroad station, and has been worked by the present operators for about two years. A depth of between 200 and 300 feet has been reached.

AURIFEROUS QUARTZ. R. Dickson, Strathcona mine, Forest Hill, Guys. Co.—The sample shown is from the "School House Lead," at depth of 285 feet. Lead from 8 to 14 inches wide. Two shafts are on this lead, one now down 345 feet, the other 250 feet. The best month's return was  $352\frac{3}{4}$  ozs. for the one month's work, and the poorest month about  $94\frac{1}{2}$  ozs. Crush in a 10-stamp steam mill.

STIBNITE (Antimony Ore), Auriferous. Dom. Antimony Co., West Gore, Hants Co.—Stibnite was first discovered here in 1880 on J. McDougal's farm. The ore occurs in two main fissure veins, called respectively the North and South veins. The former has received most attention up to now. It runs N 45° W and dips 85° to S W, and has been traced for over 1200 ft. In width it varies from a few inches to 7 ft. and in its widest part has been solid stibnite. The ore chute dips 45° to the S E. More or less gold is found in the ore, and it seems to be richest in that mineral when the percentage of stibnite is high. Whith the exception of where a cross vein of quartz comes into the vein at No. 1 shaft, none of the gold is free, even in ore assaying as high as 10 oz. gold to the ton. Assays of second-class ore has shown as high as \$186 per ton of

2,000 lbs. A very conservative estimate of the second-class ore left in the vein gives it an average thickness of 6 inches, containing 12 per cent. antimony and \$23 gold to a ton of 2,240 lbs. Four shafts are on this north vein and the amount of ground stoped is roughly estimated at 76,000 square feet of the vein. From this amount of ground stoped, 3,121 tons had been shipped before the present owner secured the property, and from then till 1901, 1,236 tons were shipped. For a long time it was not known that the ore contained gold. Full particulars of this interesting ore will be found in the *Journal of Mining Society of Nova Scotia*, vol. vi, p. 80.

ARSENOPYRITE, PYRRHOTITE AND CHALCOPYRITE (Gold, Arsenic and Copper ore). Richfield Mining Co's property, McLeod Brook, L'Abime River, Cheticamp district, Inver. Co.—This ore carries from \$4 to \$90 of gold per ton and the total value of the ore runs from \$4 to nearly \$97 per ton. Assays also show the presence of silver. The two principal deposits owned by the company are known as "Iron Cap" and "Mountain Top"—the former consisting of a bed of chlorite schist 9 feet thick, carrying auriferous arsenical ore, the latter consisting of beds of sercrite and chlorite schists aggregating 50 feet in thickness, carrying similar ore. The age of these schists is Pre-Cambrian.

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#### LEAD ORES.

In Nova Scotia these ores are known principally in the carboniferous limestone and in the pre-cambrian. As yet few attempts have been made to prospect them. The limestones carry lead ore, more or less silver bearing, in the counties of Pictou, Colchester, Halifax, Guysboro and in places in Cape Breton Island.

At Smithfield in Colchester, the presence of large amounts of galena was proved some years ago but the low silver contents and the price of lead were discouraging. It is however evident that this deposit and others in the country are well worth further consideration.

GALENITE, Argentiferous (silver-lead ore). Smithfield, near Upper Stewiacke, Col. Co.—At this locality a considerable amount of exploratory work has been done. The ore is found in limestone, apparently replacing it in part, and as a residual concentration from the removal of the rock. An one place a considerable amount of the ore is shown and the deposit, as elsewhere stated, seems to deserve further attention. The average percentage of lead, from a number of analyses, is 57; and the silver contents  $25\frac{1}{2}$  ozs. per ton.

GALENITE, Argentiferous (silver-lead ore). Cheticamp Gold Mining Co's property, L'Abime Brook, Cheticamp district, Inver. Co.—This deposit of galena was discovered in 1896 while prospecting for gold. The face of the opening is stated to show 20% galena

and 3% copper. The ore is reported to carry on an average 1 oz. of silver for every unit of lead, with gold in places up to 14 cwt. per ton.

GALENITE, Argentiferous and CHALCOPYRITE. Inverness Mining Co.'s property, Silver Cliff, L'Abime River, Cheticamp district, Inver. Co.—This property is immediately south of the Eastern Copper Co.'s property. It has so far only been prospected.

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### COPPER ORES.

Ores of this metal are found in many places in Nova Scotia. At present, extensive developments with encouraging results are being made at Cape d'Or, Cumberland County, in trap rock carrying native copper. The district lying between Springhill and Pictou, holds many outcrops of copper ore, some of which have been tested to some extent.

Polson's Lake and Lochaber in Antigonish County contain promising deposits. Coxheath near Sydney has deposits of copper-pyrites which have been developed to make the bases of a large mining and smelting business.

In the Cheticamp district, Mr. Brookfield and others, and the Eastern Copper Company, are opening up deposits, which promise the best of results, and promising indications are met over a great part of northern Inverness and Victoria.

NATIVE COPPER. Colonial Copper Co.'s mine, Cape d'Or, Cumb. Co.—This company is developing a copper mining property at Cape d'Or containing 2,300 acres. It also owns copper areas elsewhere, but its principal operations so far have been confined to Cape d'Or, where a modern mining plant has been installed, comprising air compressors, drills, hoisting-engines, and other machinery. A concentrating plant is also being erected. No. 1 lode shaft has a length of over 371 ft., with over 1,000 ft. of tunnels and drifts. No. 2 lode slope going south 326 ft. and another slope going north 300 ft., with 800 ft. of tunnels and drifts. No. 3 lode shaft, depth 180 ft., with tunnels and drifts of over 300 ft. A railroad has also been built from the mines to the mill. The native copper occurs here in veins and joints in the triassic trap.

CHALCOCITE AND MALACHITE. Hon. S. H. Holme's lease, Caribou River, Pictou Co.—This deposit has been known for a considerable period, and a fair amount of prospecting has been done. Some ore was extracted by the Copper Crown Co. It occurs in Permian sandstone.

**CHALCOCITE NODULES.** Colonial Copper Co.'s Mine, French River, Oliver, 4 m. south of Tatamagouche, Col. Co.—Sixty years ago or more, copper was first found here, and some years after the first license to search was taken out by Abram Patterson, father of late Dr. Geo. Patterson. Patterson drove tunnels and sank shafts and extracted some of the nodules which gave 74% copper. Afterwards the property was worked by Mr. Pendergrast and also by Fleming Brown, the latter being the first to work the lignitic ore referred to elsewhere. Brown's company sold to the Colonial Copper Co., the present owners. The property has been well prospected, and a number of tunnels, shafts, and boreholes have been driven and put down. It has long interested capitalists, but is at present idle. The nodules such as shown are particularly rich. Information regarding these deposits may be found in How's Mineralogy of N. S., p. 69, and the writing of Dr. Gilpin and many others.

**CHALCOCITE**, associated with "Lignite". Colonial Copper Co.'s Mine, French River, Oliver, Col. Co.—Information regarding this property will be found in the preceding note on nodules from the locality. The zone of lignitic ore is to the north of the nodule beds.

**CHALCOCITE AND MALACHITE**, with "Lignite" in Sandstone. W. A. McPherson's "mine," John Chisholm's Brook, Pugwash River, Upper Pugwash, Cumb. Co.—Copper was discovered here by J. Chisholm in 1883. Has been prospected by Mr. Chisholm and Mr. McPherson. Four trial pits and a tunnel are on the property. The copper impregnated sandstone beds are supposed to have a thickness of 12 ft., and they are said to have been proved on the strike for over a hundred feet. Four or five tons of chalcocite were shipped to Boston, and some tons are now on the site.

**CHALCOCITE AND MALACHITE** in Sandstone. W. A. McPherson's "copper claim," Canfield Creek, near Upper Pugwash, Cumb. Co.—This deposit has been prospected by Mr. McPherson, who in 1902 sank a shaft 25 ft. and took out a quantity of ore.

**CHALCOCITE, MALACHITE, ETC.**, in Sandstone. Amos Blenkhorn "mine," Acadia Copper Co., between Nappan and Maccan, Cumb. Co.—Copper was found here some ten years ago, and about five years ago a good deal of prospecting was done and a timbered slope about 80 feet. long (dipping southward about 47°), was sunk and a few tons of picked ore shipped to the Copper Crown smelter at Pictou. The ore is reported to assay from 5% to 46% metallic copper. Associated with it is argentiferous galenite, azurite, sulphides of iron and copper, lignite; and gold is said to have been shown to be present in some of the assays. The property is now unworked.

**CHALCOPYRITE, MALACHITE, ETC.**, carrying also Gold and Silver. Eastern National Copper Co.'s property, Grandin Brook, L'Abime River, Cheticamp district, Inver. Co.—The deposit which is claimed to be very extensive, is at present attracting a good deal of attention and is being prospected and developed by the above named

company. The ore, which is chiefly chalcopyrite, occurs in hydro-mica chlorite schist of Pre-Cambrian age. The ore-bearing zone or bed is said to be from 70 to 100 feet wide, but the present operations are on a pay streak 10 feet in thickness. As the result of prospecting, the company claims it has proved the existence of a deposit at least 1,050 feet on the outcrop, and 160 and 100 feet on the dip. Samples taken across the entire width of the deposit have run from 2.4 per cent. to 5 per cent. metallic copper, whilst samples from the vein and lenses have run from 5 per cent. to 8 per cent. copper. The ore also carried as high as \$8.50 per ton in gold and silver. The lowest estimate of the copper contents of the rock has been placed at 3 per cent. There is on the property a water-power estimated to run 1700 horse power. The tabulated statement below will give an approximate idea of the estimated average value per ton of the ore-body, figuring metallic copper at 12 cents per pound:—

Sample.	Gold.	Silver.	Copper.
From weathered outcrop.....	\$1.32	\$1.03	2.40 p. c.
From quartz gash veins .....	6.60	4.40	7.81 p. c.
Quartered down samples from across the deposit .....	Not assayed for.		{ 3.00 p. c. 4.00 p. c. 5.00 p. c.

One test gave the following values:

Gold .....	13 dwts. per ton.
Silver .....	7.83 ozs. per ton.
Copper .....	7.84 per cent.
Value .....	\$34.42 per ton.

CHALCOPYRITE. R. A. L. Watson's area, George River Mountain district, George River, C. B. Co.—This ore has gone very high in copper contents.

CHALCOPYRITE. "B" vein, No. 2 shaft, Cape Breton Copper Co.'s mine, Beechmont, Coxheath Hills, Cape Breton Co.—This well known deposit has been amply developed and is one of the more promising ones in this province. The company was formerly known as the Eastern Development Co. The mining areas cover 2 sq. miles and the land and water lots owned in fee, 1484 acres. Four shafts are on the property, respectively 300, 420, 100 and 45 feet deep; and the areas have been also well prospected by trial pits and trenches. The first shaft was sunk in 1880 and the last one in 1892. No. 2 (420 ft.) shaft is the main one, from which is won the ore of veins "B" and "C." The plant is excellent and includes steam hoists, compressors, 12 Rand slugger drills, large ore table, trams, saw-mill, etc., etc. A large amount of ore is on the surface and on being sampled straight across gave an average of 7% copper for the whole pile. A railway to Watson's Point, the proposed site for a smelter, has been surveyed. The mine has been closed for two or three years but is expected to open again.

CHALCOPYRITE (copper ore). Alex. Matheson property (C. P. Moffatt), George River Copper Mine, George River Mountain, C. B. Co.—Awarded 1st class diploma at Paris and Glasgow Exhibitions.

CHALCOPYRITE. French Road, C. B. Co.—Owned by J. A. McKenzie and others but leased by W. N. Young who has done a good deal of development and has an excellent plant at the mine.

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### IRON ORES.

Ores of iron are known in workable amounts in nearly every county in Nova Scotia. At present mining operations are confined to the property of the Nova Scotia Steel and Coal Company, Bridgewater, Pictou County, the property of the Londonderry Iron Company, Colchester County, and the Torbrook Mine, Annapolis County.

The deposits in the districts of Torbrook and Nictaux, Londonderry and Bridgeville are very large and in many cases of excellent quality. Deposits are also known at Pugwash, Clementsport, Clifton, Goshen, Newton Mills, Selma, Brookfield, Arisaig, Salmon River, Mira, East Bay, George River, etc, etc.

Every variety and quality of ore is met; magnetite, red hematite, brown hematite, etc.

At present the steel and iron works at Sydney are supplied with exceptionally cheap ore from Bell Island, Newfoundland, but as the cost of this ore increases, the local deposits will be called on.

RAW MATERIAL AND PRODUCTS. Dominion Iron & Steel Co., Sydney, C. B. County.—Coal, coke, Wabana Hematite (iron ore), Marble Mountain Limestone (flux), sand pig iron (Nos. 1, 2 and 3), machine cast pig iron, steel billet, steel slab, sulphate of ammonia.—The very extensive works of this company are too well known to require anything but a very brief description. The company was incorporated in 1899, and soon after began construction work at Sydney on a site of about 800 acres. The works now include, in general, a plant of 4 blast furnaces (85 ft high and 20 ft. diameter at the bosh); 10 50-ton open hearth furnaces (estimated output 1,400 tons per day); 35-inch blooming mill and pit furnaces; 400 Otto-Hoffman coke ovens (capacity 1,600 tons per day); coal washing and sulphuric acid plants, and essential by-product plants; machine shop and foundry. Ore is chiefly obtained from the company's Wabana mine (Bell Island), Nfld; limestone from Marble Mountain Iron Co.; dolomite from George River and New Campbellton; and coal from the Dom. Coal Co's mines in the Sydney coal field. The output for the year 1902 was: coke, 338,230 tons; pig iron, 191,259 tons; steel billets and slabs, 86,424 tons.

**IRON ORES.** Londonderry Iron & Mining Co.'s mine, Londonderry, Col. Co.:

Hematite, specular ore.....	67	per cent. metallic iron.
Limonite .....	50	" " "
Limonite, "bottle ore" .....	48	" " "
Limonite, Old Mountain brown hematite .....	50	" " "
Siderite, East Mines spathic ore.....	30	" " "
Ankerite .....	12	" " "

These well known deposits are now being opened up after having been unworked for some years, and the present company is making extensive preparations to mine and smelt. Furnace A is now about completed, is 75 x 17 ft., and has a capacity of 48,000 tons of foundry iron. Particulars of the various Londonderry ores will be found in a number of papers and books dealing with the economic geology of the province. The deposit occurs in slates and quartzites on the southern slope of the Cobequid Hills. It has an approximate east and west course, and has been traced for more than twelve miles; composed of carbonates and oxides of iron. Width is sometimes two hundred feet, and ore bodies of fifty feet have been found. Has been worked in places on a large scale. The following analyses of limonites are from the Report of the Geol. Survey of Canada, 1873-4 :

	OCHREY LIMONITE Cumberland Brook	COMPACT LIMONITE Ross Farm
Peroxide of iron.....	79.68 .....	84.73
Protoxide of iron.....	— .....	trace
Protoxide of manganese.....	2.51 .....	0.23
Alumina .....	0.63 .....	0.28
Lime .....	0.57 .....	0.14
Magnesia.....	0.34 .....	0.14
Silica .....	3.05 .....	—
Phosphoric acid .....	0.44 .....	0.19
Sulphuric acid,.....	0.01 .....	0.01
Water (hygroscopic) .....	0.78 .....	0.33
Water (combined) .....	11.65 .....	11.07
Equivalent to :		
Metallic iron .....	55.78 .....	58.31
Phosphorus .....	0.19 .....	0.083

**HEMATITE, SPECULAR.** H. A. Archibald's property, Erinville, Guys Co.—This property has two shafts, the deepest of which is about 75 ft. Considerable stoping has been done.

**HEMATITE, RED.**—Rev. M. A. McPherson's areas, Barachois, Boisdale, St. Andrew's Channel, C. B. Co.—This deposit has so far only been prospected, and the occurrence of iron traced for about three miles. Average analyses are said to give 65% metallic iron, and have gone as high as 69%.

**HEMATITE, SPECULAR.** R. A. L. Watson and Sheriff Ingraham's areas, Barachois, Boisdale, C. B. Co.—This ore is said to contain 67% metallic iron.

**HEMATITE, RED.** Hon. R. Drummond's Mine, Iron Mines, Skye Mountain, near Whycocomagh, Inv. Co.—This deposit, which is on the Indian Reserve, has been worked by Mr. Hood and Mr. Drummond. Two tunnels and also bore holes have been driven into the side of the mountain, and a good deal of prospecting done, revealing the presence of ore in various localities. The deposit is at present not worked.

**HEMATITE, RED.** Grand Anse, Rich. Co.—This deposit is now being prospected. Wm. McFatridge of Halifax and others being interested in it.

**HEMATITE.** E. W. Moseley's areas, Loch Lomond, C. B. Co.

**HEMATITE.** E. W. Moseley's areas, East Bay, C. B. Co.

**HEMATITE.** T. Routledge, near Marion Bridge, Mira River, C. B. Co.

**HEMATITE, RED.** East Branch Doctor's Brook, near Dunn Point, Antig. Co.—This property containing 6 sq. miles is at present controlled by C. N. Wilkie and others of Antigonish. Much prospecting has been done here by Laughlin McDonald, a New Glasgow company, and Joseph Pushie. It is claimed that there are thirteen beds of hematite opened up on the six square miles, running in thickness from 3 to 20 feet, or a combined thickness of 80 or 90 feet of ore. The zone of ore beds extends for a number of miles, trial pits and shafts having proved it in very many places. Some of the smaller beds contain the better ore, which has assayed from 40 to 53% metallic iron. A good future is expected for this property which is probably one of the best in the province. The sample shown is from a bed about 20 ft. thick with some stone partings.

**HEMATITE, RED.** C. N. Wilkie's areas, Arisaig, Antig. Co.—This is from the western part of Mr. Wilkie's areas, some particulars of which have just been given.

**HEMATITE, VAR. SPECULAR IRON.** Workingmen's Syndicate property, Springfield, Antig. Co.

**HEMATITE, RED.** Bluff on shore, G. W. Dill's farm (lease of K. and G. J. Macintosh), Cambridge, Hants Co.—Analysis gives 59.95 per cent. metallic iron. Bed as shown in face of cliff is reported to be 6 feet wide and extends 20 feet. So far the deposit has only been prospected.

**HEMATITE, VAR. RED HEMATITE (FOSSILIFEROUS).** "Shell-ore vein," Corbett's mine, Fletcher Wheelock's farm, Torbrook, Annapolis Co.—The presence of iron ore at this place in rocks of supposed Devonian age has been long known, and a quantity of ore was taken some years ago from a trench along the outcrop. The depth and extent of this "vein" was recently proved by bore-holes, and about February of this year, Messrs. Geo. E. Corbett, S. M. Brookfield and others began sinking a shaft which is now down over 50 feet. The shaft is said to have started in 6 feet of good ore, strike

N. 65 E (magnetic), and at about 40 feet had widened out to 7 feet. The mine is about  $2\frac{1}{2}$  miles from the Torbrook Iron Co's mine.

**HEMATITE, VAR. RED HEMATITE.** "Leckie vein," Torbrook Iron Co's mine, Torbrook Mines, Anna. Co.—This deposit has long been well known and much work has been done upon it and much ore raised. After having been closed for seven years the mine was unwatered in April of this year and ore raised since June, the output having recently been 75 tons per day. The mine is well equipped with machinery, the slope is 300 feet on the incline and there are 5 levels. The bed of ore varies in thickness from 6 to 12 feet (average about 8 feet.) A cross-cut south 20 ft. has struck an 8 ft. bed of hematite, overlying the one now worked. The ore is being shipped to Londonderry, N. S., to be smelted. The shipping ore averages about 55 per cent. iron. Sulphur is reported to be absent, and phosphorus not higher than 1 per cent.

**LIMONITE.** "Saddler Mine" (Fraser farm), near Bridgeville, Pict. Co.—Owned by Alex. Fraser and others. Now unworked. About 1830 ore was mined here by the General Mining Association, and about 1886 some was shipped to the Londonderry furnaces. The N. S. Steel Co. has also operated the mine on royalty. The shaft is 150 ft deep. Ore goes with land. The sample shown does not well represent the quality of the ore, no good specimens being obtainable.

**LIMONITE** Bridgeville Mining Co's Mine (Grant farm), near Bridgeville, Pict. Co.—Win Grant first found ore here some forty years ago. Worked by Pictou Charcoal Iron Co. and others. The mine is now in operation, having been opened in May of this year, and up to August 3,000 tone of ore are said to have been taken out and sold to N. S. Steel Co. at \$3.00 per ton, averaging 40% iron. The main shaft, 200 feet deep with two levels, has ceased work and a new shaft is being sunk to the north. The ore goes with the land.

**LIMONITE.** "McDonald Mine," Bridgeville, Pict. Co.—Has been pretty well developed in the past but is now unworked.

**LIMONITE.** "Cameron Mine" ("Tanner Mine"), south side road J. S. Cameron's farm, Bridgeville, Pict. Co.—Shaft 600 ft. deep, sunk by N. S. Steel Co. about 8 years ago. Ore goes with the land. Owned by Black Diamond Co. Now idle. Another shaft is on the north side of the road.

**LIMONITE.** "Fraser Mine" (Samuel Fraser's), Bridgeville, Pict. Co.—The ore here goes with the land. The mine has been pretty well developed by the Nova Scotia Steel Co. and others, but is now idle.

**LIMONITE.** Old Barns, Col Co.—This deposit is on the farms of Isaac Youill and John and Robert Forbes, and is owned by H. V. Harris, Thos. G. McMullan and others. A timbered shaft, about 100-

feet deep, with levels, has been sunk, and there is also an old abandoned shaft. About four barrels of ore were shipped this year to Montreal, but the shaft is now full of water.

**LIMONITE.** Brookfield, Col. Co.—This deposit has been known for a long period, and has been worked intermittently by the Londonderry Iron Co. and others.

**LIMONITE.** Canfield Creek, near Upper Pugwash, Cumb. Co.—Said to have been opened up by the Londonderry Iron Co. about sixteen years ago, and some tons of ore shipped to Londonderry. It has since been prospected by the Dominion Steel Co. The present specimen is possibly a poor sample of the ore. Ore also occurs across the creek, doubtless on the strike of this bed.

**MAGNETITE.** Areas of Dr. J. H. McKay and others, Upper Kemptown, Col. Co.—This ore has been known for about twenty years. Five or six beds of ore have been prospected by trial pits, one of the beds being reported to be 13 ft thick. The company owns five square miles of iron areas, which are about 4 miles from Union Station on the I. C. Ry. Coal and flux occur in the immediate neighbourhood.

**MAGNETITE.** J. A. Johnson's areas, Gerrish Mountain, Col. Co.—This deposit has been known for a long period. Said to contain 65 per cent. metallic iron.

**MAGNETITE.** Lease of Jacob S. Hart and others, Mulloch, near Whycocomagh, Inv. Co.—A good deal of prospecting has been done here and some ore extracted and piled at the shaft.

**MAGNETITE.** Rev. M. A. McPherson's areas, Barachois Mountain, St. Andrew's Channel, C. B. Co.—A shaft has been sunk 33 ft. on this property and the deposit has been traced by trial pits for a couple of miles, although its extent is said to be greater. Averages about 60 per cent metallic iron.

**MAGNETITE.** R. P. Fraser's area, Iron Mines, Skye Mountain, near Whycocomagh, Inver. Co.—The sample shewn is from a trial pit on the side of the mountain and about a mile from the road. Other prospecting has been carried on in this area. Analyses of Skye Mountain magnetite made in the laboratory of the N. S. Steel Co. gave iron contents 49 to 63 per cent. and phosphorous 0.01 to 0.5 per cent.

**MAGNETITE (Magnetic Iron Ore).** About  $2\frac{1}{2}$  miles north of Somerset post office, Kings Co.—This ore occurs in triassic traprock associated with amethyst, but so far such deposits have not been found to be of large extent. This specimen was taken from area covered by N. W. Keddy and Dr. March's lease, on Arthur Palmer's land. The vein or lens is from 7 to 10 in. thick, and the iron contents of the ore is said to be 61 per cent..

**PYRITE (Iron Pyrites).** W. M. Dustan's property, Pleasant Bay, Inver. Co.—An analysis made in the laboratory of the Dom. Iron & Steel Co., showed sulphur 41.40 per cent, iron 33.15, arsenic trace.

The deposit, which is three miles from shore, could probably be utilized as a source of sulphuric acid. Owned by W. M. Dustan of Pictou.

**PYRITE** (Iron Pyrites). Rev. M. A. McPherson's property, George River Mountain, C. B. Co.—This deposit is said to be extensive—from 20 to 30 ft. wide, and covering over 2 miles in length. Doubtless could be worked as a source of sulphuric acid.

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### GYPSUM.

The deposits of this mineral are very abundant in the central, northern and eastern countries. It occurs as hydrous or soft, and anhydrous or hard gypsum, in every variety of structure and purity. There is an export trade to the United States of about 150,000 tons a year, in addition to considerable amounts used locally for fertilizers and architectural purposes.

**CALCINED PLASTER** (Plaster Paris). Manufactured by Windsor Plaster Co., from Gypsum of T. A. Mosher's quarry, near Newport Station, Hants Co.—This company's mills at Windsor are equipped with all machinery for crushing, grinding, calcining and packing this and other products. Although much gypsum is quarried in Nova Scotia and shipped in rock form, this company has possibly the only calcining plant at present in the province. The Plaster Paris is used in making "putty finish." The company owns gypsum quarries at St. Croix and Ellershouse which it does not at present work.

**GYPSUM.** Windsor Gypsum Co's (Thos. A. Mosher's) quarry, 1 mile northward of Newport Station, Hants Co.—This quarry was opened about eleven years ago and now has a heavy output, that for 1902 being reported as about 27,000 long tons. It is connected with the Dom. Atlantic Railway and the company's wharf at Windsor. Almost the entire output is now taken, in the raw state, by the Higginson Manfg. Co. of Newburgh, N. Y.

**SELENITE CEMENT.** Manufactured by special process by Windsor Plaster Co., from Gypsum obtained at T. A. Mosher's (Windsor Gypsum Co's) quarry near Newport Station, Hants Co.—The Windsor Plaster Co. has extensive mills at Windsor, N. S., which were started about 1891. "Selenite Cement" is used for under-coating in place of mortar, and has the property of rapidly setting.

**GROUND GYPSUM** ('Land Plaster'). Manufactured by Windsor Plaster Co. from "Blue Plaster" (Gypsum), obtained at George Redden's quarry, 2 miles south-east of Windsor.—This material is largely used as a land fertilizer.

**GYPSUM** ("Blue Plaster"). George Redden's quarry, about 2 miles south-east of Windsor, Hants Co.

**GYPSUM.** Wentworth Gypsum Co's Eagle Swamp quarry, Wentworth, Hants Co.—This company has a very large output, which is shipped in the raw state to New York, U. S. A. About 200 men are at present employed at this quarry. The company owns three locomotives and a railway,  $2\frac{1}{2}$  miles long, to its wharf. Besides the Eagle Swamp quarry which is at present worked, the company owns the "Fraser" and "Blue" quarries.

**GYPSUM ("Blue Plaster").** Wentworth Gypsum Co's quarry Wentworth, Hants Co.—This is merely a bluish tinted gypsum, too dark for white work, but is ground and used as land plaster (fertilizer) for agricultural purposes, and is also used as an absorbent in stables, slaughter houses, etc.

**GYPSUM, VAR. SELENITE.** Canfield Creek, near Upper Pugwash, Cumb. Co.—This sample is from an unworked deposit.

**GYPSUM.** Near Dutch Settlement, about  $3\frac{1}{2}$  miles from Elmsdale, Hx. Co.—The quarry, which is about half a mile from the I. C. Ry., with which it is connected by a siding, made some shipments during the present summer. Some very fine selenite occurs here.

**GYPSUM.** Edw. Burgess' Quarry, Old Barns, Col. Co.

**ANHYDRATE ("Hard Plaster").** Wentworth Gypsum Co's quarry, Wentworth, Hants Co.—This mineral occurs in lenticular masses and beds associated with the soft plaster or gypsum. It is at present put to no use, except occasionally, perhaps, for foundation stones.

### MANGANESE.

The ores of manganese found in Nova Scotia are noted for their purity. They occur in limestone divisions of the carboniferous at a number of places in the province. The best known locality is Tenny Cape, in Hants county. Here a very rich and pure ore has been worked at intervals for a number of years. At one time the price realized was as high as \$130 per ton. The ore occurs in strings and pockets in limestone. In this county the surface indications are extended over a large tract of land, but at present no work is being done. Similar ores are met at Onslow, near Truro, and at Loch Lomond, in Cape Breton county, but have not been mined to any extent. There are indications of the ore in a great many other places, but the deposits seem to be too small to work. A recent discovery was reported from New Ross, in Lunenburg County. Here the deposits are described as being of good value, but are at present too far from water to permit of shipment economically.

**PYROLUSITE.** John S. Archibald's mine, Manganese Mines, near Valley Station, Col. Co.—First worked about 1881 by D. Archibald and A. Carter. Three timbered shafts are on the property, the last having been sunk last fall, but no work is at present

being done. Boiler, engine, pump and riddles are at the mine. Picked ore from here has sold for \$90 a ton, but average price was about \$60. The ore occurs in a red sandstone.

**PYROLUSITE** Fred Shipley Mine, about half mile west of Brookdale, Cumb. Co.—This deposit which occurs in carboniferous limestone, was discovered about seven years ago. A pit about 20 ft. deep was sunk on it, and a number of tons of ore shipped. Edward Curran and W. O'Neil are reported to own the deposit.

**PYROLUSITE.** George E. Boak's property, Tenny Cape, Hants County.—This deposit has long been known and has supplied a large proportion of the fine ore which has been shipped from the province, and which at times has brought very high prices. The ore appears to be principally connected with red and grey limestone, dolomitic in composition. The mineral occurs in irregular nests or pockets, and in seams eroded on the bedding planes and cross fractures. It is chiefly a fibrous pyrolusite, with splendid lustre, based on a compact or granular ore consisting of pyrolusite, of psilomelane, and of manganite, the latter not in large quantity. Many tons have been shipped, yielding as high as from 88 to 95 per cent. of available oxide of manganese. The annual production here has seldom exceeded 200 tons, most of which, it is said, is used by glass-makers. One pocket produced no less than one thousand tons of ore. Further information regarding this mine will be found in most works dealing with the economic minerals of the province.

**PYROLUSITE** G. W. Churchill's property, Walton, Hants Co.—Very fine manganese ore is found here, and the above remarks regarding the Tenny Cape ore will apply generally to this deposit.

**PYROLUSITE** E. W. Moseley's property, Loch Lomond, C. B. Co.

**MANGANITE** (manganese ore). Bridgeville, Pict. Co.—This ore occurs in association with the limonite of this district, and very beautiful specimens have been found.

## ANTIMONY.

A sulphide of this ore occurs near Rawdon in Hants county, carrying considerable percentages of gold and silver. A mine is opened on this deposit, and about 3,000 tons were shipped. Other deposits are known in the vicinity also carrying high gold values, and it is probable that before long attempts will be made to work them as well.

**STIBNITE** (Antimony Ore), auriferous. Dom. Antimony Co's mine, West Gore, Hants Co.—An account of this interesting ore will be found under the heading of Gold in this catalogue, p. 17.

## LIMESTONE.

This stone has not been used to any extent in Nova Scotia for building purposes, although it is frequently well suited to that work.

The limestones of Nova Scotia, sometimes occurring as marble as at West Bay and other points in Cape Breton, are largely quarried by the iron companies for fluxes. A considerable amount is converted into lime and exported to neighboring provinces.

**CALCITE, var. MARBLE.** Marble Mountain, West Bay, Inver. Co.—The Marble Mountain deposits are probably the finest beds of workable marble yet found in the province. It contains little or no admixture of foreign materials, is uniform in texture and of unequalled abundance. The following varieties have been recognized: (a) fine white statuary marble, (b) fine white building marble, (c) coarse white building marble, (d) blue and white clouded marble, (e) Brocatello marble, mixed with six varieties of coloured marble, (f) fine flesh coloured marbles, often striped and variegated. These marbles are in some cases magnesian. The locality offers every facility for quarrying and shipping. Blocks of large size can be obtained. This deposit which has attracted much attention, is at present extensively worked by the Dominion Iron & Steel Co. (the owners) as a source of flux for their furnaces at Sydney. A large plant is operated for carrying and crushing the stone. The marble of the locality has also been burnt and furnishes an excellent lime. The sample shows one of the varieties of building marble, as used in a building recently erected at Halifax.

**CALCITE, var. MARBLE, White.** E. T. Bown & Co., Eskasonie, C. B. Co.—This excellent marble was awarded a prize at the Paris Exhibition. The property has been partly developed. Shipments can be made within 400 or 500 yds. of the deposit. The sample shown is from the surface.

**CALCITE, var. MARBLE, Varigated, Red.** Walton, Hants Co.—The unusual color of this stone has attracted the attention of all who have seen it in the polished state. It seems to be a recent discovery and if in sufficient quantity will doubtless find a very ready sale. The deposit is owned by G. W. Churchill of Hantsport.

**CALCITE, var. MARBLE, White and somewhat Veined.** G. W. Churchill's property, Walton, Hants Co.—This stone seems to be of good quality.

**CALCITE, var. LIMESTONE, Fossiliferous.** Ferry Farm, Windsor, Hants Co.—This lower carboniferous limestone is being manufactured into lime by J. T. H. Muller of Windsor. The sample shows the highly fossiliferous character of the rock. The following analysis was made by Dr. How:

Carbonate of lime.....	97.64
Carbonate of magnesia.....	1.10
Oxide of iron.....	.07
Phosphoric acid.....	trace
Insoluble residue.....	.68

CALCITE, var. LIMESTONE, Grey. McCabe's Quarry, Brierly Brook, Antig. Co.—From this well known quarry was obtained the stone from which St. Ninian's cathedral at Antigonish was constructed. It assumes a pleasing warm tint on weathering which to many tastes is an advantage.

CALCITE, var. LIMESTONE, Grey. H. F. McDougall's quarry, Christmas Island Station, C. B. Co.—Used mostly for foundations, but it is expected to place it on the market as a dressed stone. Work at present is intermittent according to demand.

DOLOMITE. McDonald Farm, Stewartdale, about three miles west of Whycocomagh, Inver. Co.—The stone is nearly pure white, rather coarsely crystalline, and has been quarried for a couple of months this summer by a Halifax firm, to be ground and used in paint making.

DOLOMITE (Magnesian Limestone). Catalone Lake, C. B. Co.—This deposit is owned by T. Routledge of Sydney, and is  $2\frac{1}{2}$  or 3 miles from the railway. It is of a dark grey colour. It is reported to be excellent for metallurgical purposes. One analysis gave the following composition:

Silicia.....	1.25
Iron .....	.71
Manganese .....	.63
Alumina .....	2.08
Lime .....	57.64
Magnesia .....	37.80

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100.11

### BARYTES.

This mineral is frequently met in the province, and an annual production has been maintained for a number of years, varying from 700 to 800 tons. The production has been used locally in the manufacture of paints and enamels. At present it is mined at Lake Ainslie, and Cape Rouge, Inverness County.

BARITE (Barytes). J. H. Sellar's Mine, Hodson, 5 miles from River John, Pictou Co.—This mineral occurs in veins and pockets in Permian brown sandstone, the zone of veins being it is said, about seven feet wide, and extending for some distance. First prospected by Mr. Pendergrast, about 25 or 30 years ago, who worked it for a couple of years and took out and shipped about 480 tons, valued at \$2,400 to Portland, Me., by way of River John. About three years ago Mr. Patrick sank a new shaft, and took out

a few tons, but did not ship. Two shafts are on the property, but it is now idle.

**BARITE (Barytes).** South Branch, Black Brook, near Springhill, Cumb. Co.—The barite at this locality occurs in narrow veins from about  $\frac{1}{2}$  to 5 inches in diameter, and so far has not been found to be of economic importance.

**BARITE (Barytes).** "Johnston Mine" (Henderson & Potts), eastern side Lake Ainslie, Inv. Co.—This ore is shipped to Halifax, and ground for use in paint making. The deposit is said to be fairly extensive, and is worked intermittently according to demand. It is shipped at Whycocomagh. The samples also show Messrs. Henderson & Potts ground barytes from this locality as well as from Newfoundland mineral, also ground marble from Marble Mountain, and ground dolomite from Stewartdale (Whycocomagh).

**BARITE (Barytes).** Eastern Milling Co's property, Cape Rouge, Inv. Co.—This deposit produces excellent barite, very free from colour. It or a neighboring deposit has been worked lately and the mineral ground for use in paint making by Messrs. Henderson & Potts of Halifax, and by the Eastern Milling Co. of Dartmouth, the latter using a bleaching process also. A sample of the bleached ground mineral is shown as well as unbleached ground, the latter from "off colour" material.

**BARITE (Barytes).** Eastern Milling Co's. "McDougal" mine, east side of Lake Ainslie, Inv. Co.—The samples show the raw and ground mineral, the latter being both bleached and unbleached.

**BARITE (Barytes).** Five Islands, Col. Co.—This locality has furnished some fine cabinet specimens, as well as a quantity for commercial purposes. Occurs in pockets in limestone.

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#### BUILDING STONES, ETC.

The principal stone used for structural purposes in this province is either sandstone or granite. There are several varieties of the former, passing from a very light fawn to a purple red color. The principal quarries are along the Strait of Northumberland from Merigomish to the Joggins, in Cumberland County. These quarries are situated near railway and water transport, and are worked to some considerable extent.

Freestones have also been quarried in Cornwallis, Horton, Kennetcook, and in Cape Breton. The Millstone Grit likewise has been drawn upon for a yield of building material.

Granite is very abundant among the older rocks of the province along the Atlantic coast. It has been quarried extensively near Halifax and at Shelburne.

In the Cobequids there are masses of flesh and red colored syenites which have yielded handsome polished specimens. Similar stones are found in various parts of Cape Breton.

SANDSTONE, var. FREESTONE, Red. R. E. Chambers' quarry, Toney River, near Seafoam, Pictou Co.—Quarry opened by Mr. Chambers' about twenty years ago, but active operations were only commenced a couple of years ago. Ship at quarry wharf on Toney River, and at Rogers' siding, Oxford-Pictou branch I. C. Ry. Last year's output was about 700 tons, average price for dimension stone, \$5.00.

SANDSTONE, var. FREESTONE, Grey. W. R. McKenzie's quarry, near Stillman, Six-mile Brook, off West River, Pictou Co.—Quarry opened over ten years ago by Robt. Elliott and then passed to Fraser & Cunningham. The stone is of a very fine grade and is sold chiefly for monuments, the price being about \$8.00 per ton. It is worked by "plug and feather." Shipment by water is made at Pictou, and by rail at West River Station, both long hauls.

SANDSTONE, var. FREESTONE, Grey. Pictou Quarries Co., Pictou.—The quarry is located about  $1\frac{1}{2}$  miles from the centre of Pictou town. The stone is shipped by rail and water at Pictou, and generally sells for about \$8.00 per ton for dimension blocks. Chief market is Nova Scotia and Prince Edward Island, and has been used in many buildings of note. One block of stone actually quarried measured 40 x 6 x 6 ft. and weighed 115 tons. The face is 55 feet deep, and the output to August, 1903, about 500 tons. Opened about 25 years ago by McKeen & Hogg. An analysis of the stone is as follows:—

Silica .....	74.97	p. c.
Alumina .....	10.27	
Iron Oxide .....	7.02	
Lime .....	2.42	
Manganese .....	.31	
Magnesium .....	2.70	
Water .....	2.31	
Organic matter .....	trace.	
<hr/>		
Total .....	100.00	
Specific gravity .....	2.63	

SANDSTONE, var. FREESTONE, Grey. W. Gammon (now H. C. Reid's) quarry, River John, Pict. Co.—This quarry has been opened about two years and is situated on bank of River John, and about a mile from the village. Shipped at Fitzgerald's siding, I. C. Ry. near by. Face about 10 to 14 high and 300 feet long. Has had a fair output, and sells for about \$5.00 per ton for dimension stone.

SANDSTONE, var. FREESTONE, Brownish. Wm. Gammon's quarry, River John, Pictou Co.—This is close to the Gammon greystone

quarry, and was opened about ten years ago. Similar remarks apply to both.

SANDSTONE, Red. Campbell's Quarry, Tatamagouche, Col. Co.—This stone has been used locally, and for railway work, but is said not to stand well where affected by water and frost.

SANDSTONE, var. FREESTONE, Grey. "Old Battye Quarry, Battye Brick & Freestone Mnfg. Co., Wallace Bridge, Cumb. Co.—The famous Old Battye Quarry was opened in 1809 by Wm. Scott of Halifax, who quarried there the stone used in building the Province Building at Halifax. From Scott the property passed to Mr. Seaman, of Minudie, and then to Tom Battye, of Wallace, then to Fred Battye & Co., then to Geo. Battye, and finally in 1900 the present company was formed. Besides being used in the Province Building, the stone has been employed in erecting the Bank of Montreal, Sydney, the Bishop's Palace and Prowse's Block, Charlottetown, and many buildings in Boston, Baltimore, New York, Providence (R. I.), Montreal, Halifax, etc. Also used in many bridges. The beds dip 25° to N 50° W. Quarry is at present idle, but expects to open next year with improved machinery. Two acres of stone are worked out, but the company has about 40 acres of quarry land yet. The clay cover got very heavy, making "stripping" expensive, but this is now being utilized in making excellent brick.

SANDSTONE, var. FREESTONE, "Olive" and "Blue." Wallace Stone Co., Wallace, Cumb. Co.—This well known quarry was opened 40 or 50 years ago by Wm. McNab. Afterwards operated by Wallace Huestis Greystone Co., and Wallace Greystone Co. With it is now incorporated a quarry opened about 20 years ago by Mr. Battye, afterwards known as the Dobson Quarry. The stone of the Wallace Stone Co. is fine grained and of excellent quality, and has long been favourably known. The area of quarry as opened is roughly about 600 x 600 feet, the rock face is about 50 ft. deep, and the bedding is nearly horizontal. A very large and improved plant and a large number of men are now employed here, part of the quarry being leased to M. J. Haney for a special contract. The latter has placed a gravity track to the wharf on Wallace Harbour, about a quarter of a mile distant. There is about a two mile haul to the railway. The average output in the past has been about 1,500 quarry tons, but for the last couple of years has doubtless many times exceeded that. A large amount is shipped to the United States and Canada as well as used in the province. Average price of dimension stone is about \$5 per ton.

SANDSTONE, var. FREESTONE, Reddish. Oakley Myers' "Northport Redstone" quarry, Cold Spring Head, Amherst Shore, Cumb. Co.—The face of this quarry is about 35 ft. deep and 100 ft. long. The stone is lightered to Pugwash, where Mr. Myers has a storage yard. Average price per ton about \$4.50 on board car at Pugwash. The post office at Springhill is entirely constructed of this freestone, and it is also partly used in the Royal Bank at Sydney and in some portions of the new Custom House at Halifax.

SANDSTONE, var. FREESTONE, Grey. John J. Fraser quarry, Rockley, River Philip, Cumb. Co.—Stone has been raised at this quarry for about 15 years, and the face is now said to be about 20 ft. depth and 75 ft. in length. The nearest shipping point is Pugwash, to which it is lightered. The price of average stone is about \$4.50 per "stone ton" of 14 cubic ft., on car at Pugwash. The stone has been used in Sydney, St. John, Parrsboro, New York, etc. The quarry is at present leased by O. Myers.

SANDSTONE, var. FREESTONE, Greyish-brown. Edward Curran's quarry, Amherst, Cumb. Co.—This quarry was opened in the spring of 1902 and now has a face of about thirty-five feet.

SANDSTONE, var. FREESTONE, Red. Amherst Redstone Co., (J. Donald quarry), Amherst, Cumb. Co.—This quarry has been opened about fourteen years and now has a face of about 60 feet. Its area is about 150 x 150 feet. From 20 to 40 men are employed, and the stone is worked by steam derricks, Rand drill and Ingersol trencher. The stone which has gained much favour has been marketed from Halifax to Toronto and also in Massachusetts. The Roy Building, Halifax, is built of it, as will also be the Halifax Customs House now in course of construction.

SANDSTONE, var. FREESTONE. Brenton Beckworth's quarry, Kelly Brook, Kellyville, about 3 miles from Hantsport, King's Co.—This quarry furnishes a building stone which is a good deal used locally, and is at present being used in trimmings for the new Middleton schoolhouse. About 300 or 400 tons have been quarried this year.

SANDSTONE, var. FREESTONE, Brown-red. S. W. Churchill's property, Walton, Hants Co.

SANDSTONE. Daniel McLean's quarry, Hardwood Hill, Sydney, C. B.—Used locally for foundations and also in a few instances for trimmings.

GRINDSTONES. Atlantic Grindstone Co., Lower Cove, Cumb. Co.—This quarry has produced grindstones since 1790, and they are of a very superior quality. Many years ago the output was sometimes 5,000 tons annually. The present company bought the property from R. L. Hibbard in 1901, and erected a large new plant, including 6 gang saws for cutting stone into different widths, turning lathes for finishing, tram cars, etc. This plant has a capacity of 10,000 to 15,000 tons annually. The company owns 300 acres and the quantity of stone is unlimited. Some of the best grits are quarried under the tide at low water. The stone is extracted by open quarrying, but it is proposed to undermine as is done in other places with success when the cover is heavy. Grindstones are made by the company from 5 pounds to 4 tons in weight. A large part of the output has been exported to the United States. Machinery is to be installed at an early date to manufacture oil-stones, scythe-stones, kitchen-stones and whet-stones.

**SCYTHE-STONE.** Lower Cove, Cumb. Co.—It is reported that scythe-stones are not at present manufactured here, but were recently and will be shortly. The stone is well adapted for such use.

**GRANITITE** ("Red Granite"). Cape Breton Red Granite Co.'s (H. F. McDougall's) quarry, Barachois Station, foot of Boisdale Hills, C. B. Co.—This stone has been so far used only in crushed form as "McAdam" for roads, and as such has been very largely used in the neighboring towns. Two steam crushers are in use and from 55 to 60 men employed.

**GRANITE.** Shelburne, Shel. Co.—A large amount of granite exists in this locality and has been quarried and largely utilized in building and for street paving-blocks. It is of finer grain than the Halifax granite. The Herald Building at Halifax is constructed of this stone.

**GRANITE.** John Kline's quarry, near Nictaux, Annapolis Co.—This is a very fine grade of granite which is much used for monumental work. It takes a fine polish, is of a dark color, and shows great contrast when cut.

**GRANITE.** John Kline's quarry, Witherod Lake, North West Arm, Halifax Co.—This well-known quarry has been worked for a number of years and a very large quantity of excellent stone has been taken out and used for buildings and monuments. Mr. Kline has an excellent plant for sawing, cutting and polishing this stone.

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#### FIRE CLAY.

**FIRE CLAY.** Acadia Coal Co., Albion Mine, Stellarton, Pictou Co.—This clay is directly overlying the 4 ft. seam of coal and is from 30 to 40 ft. thick. It has been utilized in the manufacture of fire brick.

**ALTERED FELSITE** (suitable for Fire-Clay). Mill Brook, East Branch of Watson Brook, Coxheath Hills, C. B. Co.—Formerly Rev. M. A. McPherson's property, now N. S. Steel and Coal Co.'s. Is at present being developed. A series of experiments conducted in the laboratory of the Geological Survey of Canada has shown this material to be well adapted to the manufacture of fire-bricks when mixed with from  $\frac{1}{2}$  to 1 per cent. of lime. Composition: silica .76.260, alumina 19.152, iron oxide, trace, lime .555, magnesia .170, alkalies .259, combined water 4.300. (See reports Geol. Surv.).

**ALTERED FELSITE** (suitable for Fire-Clay). McIntyre property, Coxheath Hills, C. B. Co.—Contributed by T. Routledge, Sydney.

## CLAY AND BRICKS.

**Brick Clays** are found in many places, the best known fields being those of Shubenacadie, Hantsport, Annapolis, Stellarton, Pugwash and other points in Cape Breton. When these clays are properly tempered they yield a good and strong brick.

**CLAY AND BRICKS.** Mira Brick Co., Mira River, C. B. Co.—Situated about 3 miles from Mira Gut. The clay worked is said to be the same from which the French made bricks for Louisbourg. The clay bank is said to be 45 feet deep. The top, for from 2 to 4 feet, is of red color, but below that the clay is of a bluish tint. Steam power is used, the bricks dried in the air on "hacks" and fired in ordinary kilns. Lighter to Mira Gut for shipment.

"**SILICATE BRICK.**" (Sand-lime Brick). Manufactured from North Sydney silica sand and New Brunswick lime. C. B. Silicate Brick Co., North Sydney.—This is a new industry in Canada of which much is expected. The bricks are moulded from a mixture of sand and lime and are then placed in a steamer where they are subjected to steam at a pressure of 130 lbs. per sq. inch for from 9 to 10 hours. As a result of this a cement is chemically formed which under proper conditions is very strong. The bricks can be tinted any color, but at present the company only produces a grey brick of a very pleasing tint. The process is known as the Oscar Hugo Anderson patent. It is a German invention and the manufacture of similar brick as well as building stone is assuming large dimensions in Germany and Sweden. The present company started to manufaeture in December, 1902, being the first factory of this kind to operate in Canada. The output with the present plant is from 6,000 to 7,000 per day. A large building is now being erected in North Sydney with the brick.

**CLAY AND BRICKS.** International Brick and Tile Co., Bridgetown, Annapolis Co.—The samples show pressed brick as well as a pattern known as "bull-nose," suitable for round corners, windows and door jambs.

**CLAY AND BRICKS.** Eastern Canada Brick and Tile Co., Sylvester, Pictou Co.—The yearly output of these kilns is between 2 and 3 millions. Steam pugging mill is used and side cut 6-brick machine; bricks dried in air and kilns of ordinary construction.

**CLAY, SAND AND BRICKS.** Maritime Clay Works, Pugwash, Cumb. Co.—This is usually spoken of as the best brick making plant in the province. A kiln of the ordinary kind was operated here about four years ago, but in 1900 an improved, permanent, "continuous kiln" was started, after plans forwarded from Los Angelos, California. Placing the unburnt bricks, firing, and removing the finished product goes on continuously in one long chamber, the parts being ingeniously separated by a partition of ordinary wrapping paper, which is defended from combustion by the course of the drafts until another compartment is filled and

ready for firing, when the draft is cast through the partition and destroys it. Coal, fed from above, is used in firing. The pugging-mill, wire-cut, and other machinery is driven by steam, and the dry house is steam-heated. The company owns its own locomotive, tip-cars, and narrow-gauge railway to its clay bank on the Pugwash River. The capacity of the works is said to be 38,600 bricks per day, clear of "smash-ups." The capacity of the kiln is 400,000, if filled, which is not possible in the continuous system of operating. The samples show the clay, with the sand used as a binder, a soft mud brick as it comes from the machine, and five stock bricks as supplied the trade.

**CLAY AND BRICKS.** "Old Battye Quarry," Battye Brick & Freestone Mfg. Co., Wallace Bridge, Cumb. Co.—This company started in 1900 to manufacture bricks from the 30 ft. bank of clay covering their stone. The first year two millions were made, the second year 2,800,000, and the third (present) year the output is expected to reach nearly 5,000,000. Only stock brick are manufactured. 650,000 brick are now on hand. The machinery is all driven by steam and is of improved type, and the dry house is steam heated. At present "fire" in two ordinary kilns but expect soon to erect a "down-draught continuous kiln," and next year will probably make pressed brick. The brick sells for \$6.00 per thousand on board cars at Wallace Bridge station, I. C. Ry. The company has a 2200 ft. siding and spur connected with the Oxford & Pictou branch of the I. C. Ry., about a quarter mile eastward of Wallace Bridge station.

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#### MOULDING SAND.

**MOULDING SAND.** Conn's Mills, Cumb. Co.—This sand, which is found near R. Chestnut's farm, about three miles from Conn's Mills station, I. C. R., is controlled by the Amherst Foundry Co., which reports it very good for furnace castings, light machinery work, etc., but not fine enough for stove work. It is sold for \$1.25 per ton f. o. b. at Conn's Mills. The deposit is said to be rather shallow.

**MOULDING SAND.** Dill's farm, near Windsor, Hants Co.—This sand has been occasionally used by the Windsor Foundry & Machine Co.

**MOULDING SAND.** Murray's sand bank, Avondale, Pict. Co.—This sand is used altogether for moulding at Fraser Bros. Foundry, New Glasgow, and is found to be of good quality. It is marketed in various parts of the province.

## MISCELLANEOUS.

PYRRHOTITE (Magnetic Iron Pyrites), Nickel Ore. Rev. M. A. McPherson's property, George River Mountain, C. B. Co.—Deposit reported to be large, running in form of a vein for over 3 miles. The nickel contents have not been reported, but if sufficiently large would probably be worth attention as a source of nickel.

TALC, var. SOAPSTONE. Soapstone mine, Brigend Brook, about 3 miles from Whycocomagh, Inver. Co.—This deposit was worked about seven years ago by R. P. Fraser and also possibly by others. The stone was obtained from a shaft on the side of the road, and a quantity of the material extracted. It is now unworked.

CELESTITE. Dominion Steel Co's Dam, Sydney River, C. B. Co.—This mineral, which is an ore of strontium, occurs in a 12-inch bed at this place, the only locality in the province. Strontium is used in producing a crimson light in pyrotechny.

DIATOMACEOUS EARTH (Tripolite). Fossil Flour Co., Bass River, Col. Co.—This company for some years, has been preparing for the market a large deposit of diatomaceous earth occurring in a lake bed. The samples shew two qualities.

PAINTS. Hydrated oxides of iron and manganese occur frequently in Nova Scotia. Some small use has been made of them for paints, but the demand is principally met by a cheaper imported article.

Among other minerals that are known to occur in the province but which have not as yet been found in amounts of economic importance may be mentioned sulphur, in the form of common and magnetic iron pyrites, molybdenum, cobalt and nickel, zinc; tin, phosphates, and salt (as brine).

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## ERRATA

Page 4, 3rd line from bottom, for 37.008 read 57.008



*App. 2.*

# Nova Scotia.

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# Deep Gold Mining.

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Report on the best methods of testing the value  
of the deeper Gold Deposits of Nova Scotia.

BY

E. R. FARIBAULT, C. E.,  
Geologist of the Canadian Geological Survey.

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Printed by order of the Government of Nova Scotia.

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THE COMMISSIONER OF PUBLIC WORKS AND MINES, KING'S PRINTER.  
1903.



MINES OFFICE, HALIFAX, AUG. 20, 1903.

*The Honourable Arthur Drysdale, K. C., M. P. P., Commissioner of Public Works and Mines,*

SIR,—I beg to hand you herewith the text of an Act passed at the last session of the Legislature, entitled "An Act to encourage Deep Mining in the Gold Fields of Nova Scotia," being Chapter 9 of the Acts of 1903.

WHEREAS, it is desirable that deep mining should be encouraged in the gold fields of Nova Scotia:

Be it therefore enacted by the Governor, Council, and Assembly, as follows :

1. The Governor-in-Council shall and they are authorized to appropriate a sum of money sufficient to assist in the sinking of not more than three deep shafts in the gold fields of the province.

2. Such shafts shall be sunk in such places as may be determined upon by the Governor-in-Council, and shall be under the direction of the Inspector of Mines, and the sinking shall be under such regulations as may be made by the Governor-in-Council.

3. The Governor-in-Council shall only assist in the sinking of a shaft below 500 feet from the surface, and to a vertical depth not exceeding 2000 feet, and in such assistance the government shall not bear more than half the expense of the actual sinking.

4. The Governor-in-Council is authorized in carrying out the objects of this Act to enter into arrangements with any mining company, corporation, or person carrying on the business of gold mining, or with any person, firm or corporation that may hereafter enter into the business of gold mining.

The subject of the working of gold mines in Nova Scotia to depths commensurate with those reached in gold districts in other countries, has for some time received the consideration of your honourable Government. Hitherto the practice of local mining enterprise in this Province has been to work out such pay streaks or rich portions of veins as happened to show on the surface, and then to abandon the veins. This system of mining, however pardonable in the beginning, is inexcusable in view of the present advanced knowledge acquired by mining operations throughout the world.

Hundreds of gold mines, deep and profitable, have shown that gold is not a surface mineral, but follows copper, lead and other minerals to depths which, if not quite beyond reach, are inaccessible by ordinary working.

As the Canadian Geological Survey had for many years devoted much attention to the accumulation of the facts connected with gold mining in this Province, and had placed their work in the hands of Mr. E. R. Faribault, Geologist to the Survey, it has been deemed advisable to utilize the intimate knowledge this gentleman has acquired of our gold fields.

After procuring authority from the Legislature of Nova Scotia, Mr. Faribault, with the permission of the Director of the Canadian Geological Survey, has prepared a preliminary report. In this he presents the facts he has collected and given in fuller detail in the publications of the Survey, which show the presence of bodies of gold bearing quartz deeper than any hitherto mined.

In view of the importance of the subject of deep gold mining to the Province, this report of Mr. Faribault's is now printed for distribution among those interested in gold mining. It is believed that the facts and deductions presented by Mr. Faribault will be new and of interest to many, and to those familiar with his reports their presentation in a concentrated form will be of service.

The report is issued in the belief that it will assist companies and individual operators in considering the subject, and in arriving at a clear understanding of the localities best suited for deep sinking and for assistance on the part of your honourable Government.

I have the honour to remain,

Yours obediently,

E. GILPIN, Jr.,

*Deputy Com. P. W. & M.*

# **Deep Gold Mining In Nova Scotia.**

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**By E. R. FARIBAULT,**

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## **POSSIBILITY OF DEEP MINING DEMONSTRATED BY THE GEOLOGICAL SURVEY.**

The knowledge now gained by a detailed survey of the principal gold districts of Nova Scotia proves conclusively :

That the veins which coincide with the stratification and outcrop at the surface are the remnants of north or south legs of superimposed "saddle-veins" occurring on anticlinal folds, the apices of which have been truncated by extensive denudation.

That these saddle-veins are underlaid by a succession of other superimposed saddle-veins which do not out-crop at the surface, but occur deeper down on the axis-plane of the anticlinal folds.

That all the mining done for the last forty years has been confined to the saddle-veins outcropping at the surface, and the richest and most workable portions of these are now mostly exhausted. It is therefore desirable that the succession of underlying saddle-veins should be developed in depth, as it affords an extensive field for deep gold mining.

## **ANALOGY OF THE BENDIGO SADDLE-REEFS.**

From the analogy of the gold-bearing saddle-reefs of Bendigo, Australia, occurring in a similar manner and profitably operated to depths reaching four thousand feet, it may be inferred that the Nova Scotia underlying saddle-veins will be found as large in size and as rich in gold as those cropping at the surface.

## **DEEP MINING PROVED BY ACTUAL PRACTICE.**

It is difficult, however, to induce capitalists to invest money in such extensive mining developments in Nova Scotia, unless similar undertakings have already proved successful in actual practice. It is therefore very gratifying to know that the recommendations of the Geological Survey have already been put into practice at the Doliver Mountain, Richardson, Bluenose and Dufferin mines; and

although the developments are as yet limited the results obtained are most satisfactory and conclusive, and testify to the accuracy and value of the work done by the Survey. They prove that auriferous saddle-veins may be found to recur underneath one another to even greater depth and in much closer succession than in Australia, and what has been accomplished at these mines can also be done in many other districts in the Province where the conditions are favourable.

Appendix (A) gives some observations and sectional plans by the writer, taken from the summary report of the Geological Survey for 1902 (to be published this month) on the important developments recently made on the arch-core of the anticlinal folds at the Bluenose, Dufferin, Richardson and Doliver Mountain mines.

#### OPPORTUNITY FOR GOVERNMENT AID.

The time is opportune, and it is desirable that the Provincial Government should encourage deep gold mining in Nova Scotia, by assisting in the development and testing of the underlying saddle-veins and prove conclusively in actual practice their recurrence and value to great depths. An Act recently passed by the Provincial Government authorizing an appropriation to aid in the sinking of three deep shafts to depths reaching 2000 feet is most welcomed by those who have a knowledge of the great possibilities of the Nova Scotia gold fields for deep mining. Such developments, if properly carried out, will be a good object lesson as to what may be accomplished at other mines; they will attract the attention of foreign engineers and capitalists, and will undoubtedly be the inauguration of a new era of extensive and permanent gold mining in Nova Scotia.

#### CONDITIONS FOR SUCCESS.

The following observations are intended to indicate some of the means by which the objects contemplated by the above Act can be most economically and effectually attained. They may also be of service in encouraging a better general system of underground development, which will result in establishing gold mining in Nova Scotia as an industry more permanent than it appears to be under present methods.

To be successful it is absolutely necessary that the knowledge accumulated for the last twenty years by the work of the Geological Survey in the Nova Scotia gold fields and the vast experience gained in the Australian gold fields should be fully taken advantage of.



*CROSS-SECTION*  
OF

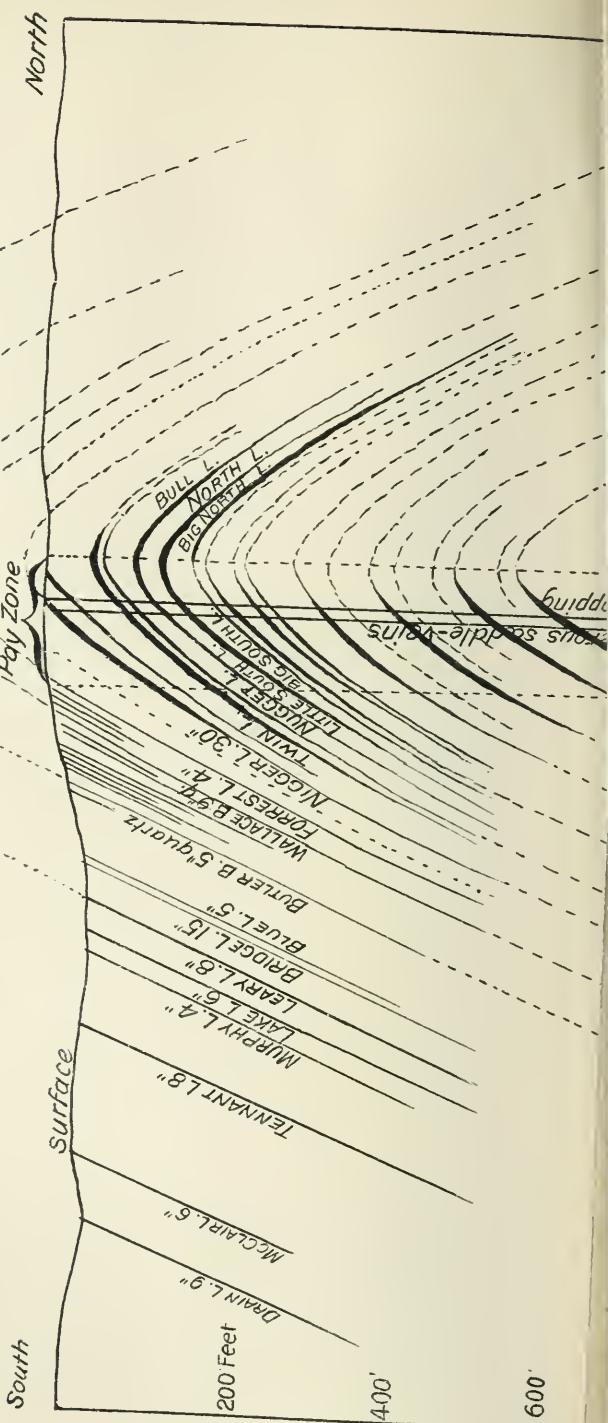
TANGIER GOLD DISTRICT

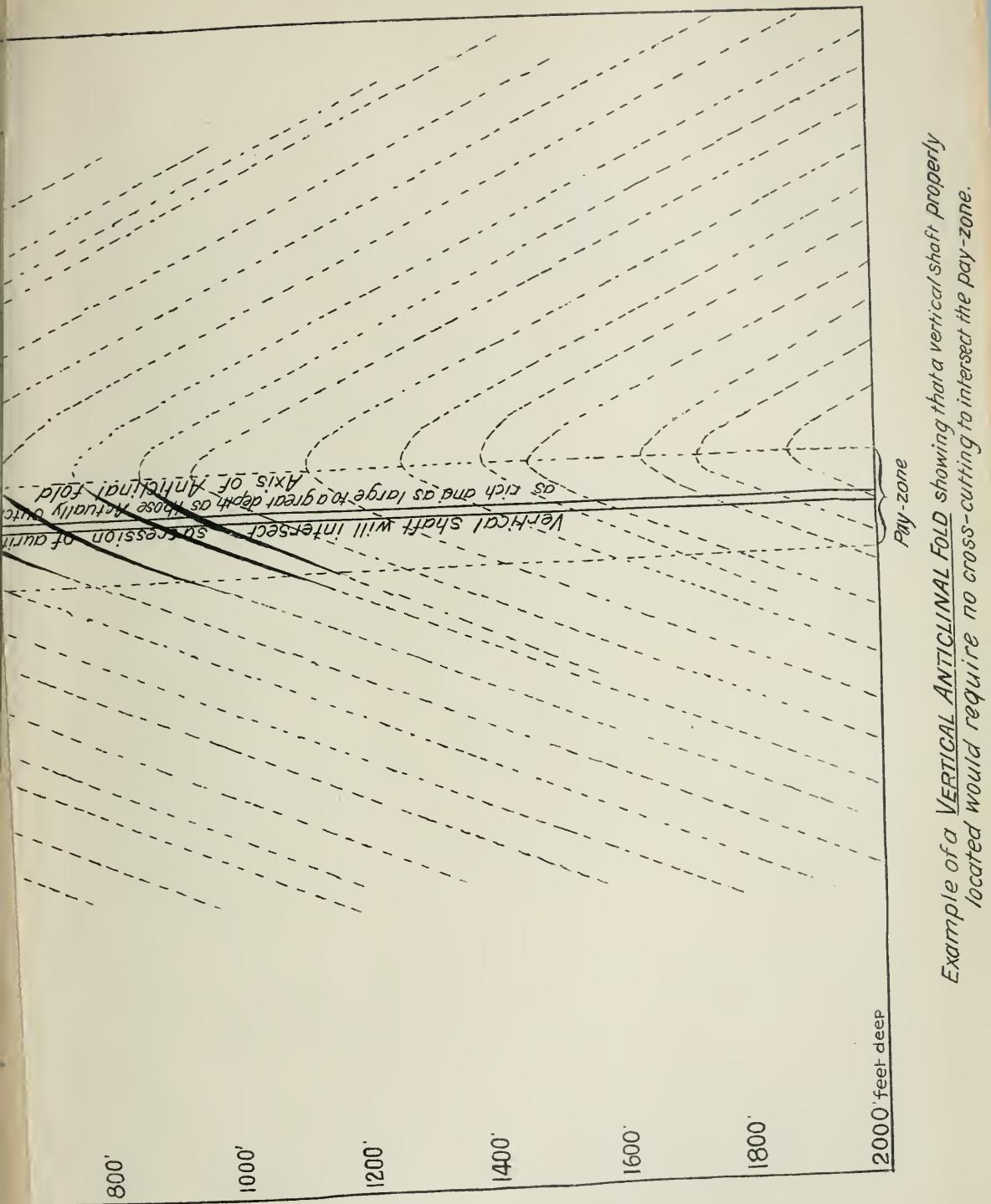
Nova Scotia,

BY

E.R. Faribault, B.A.Sc.

Scale in feet  
100 200 300 400 500 600 700 800 900





Example of a VERTICAL ANTICLINAL FOLD showing that a vertical shaft properly located would require no cross-cutting to intersect the pay-zone.



### MR. C. K. LEITH'S TESTIMONY.

Mr. C. K. Leith, of the United States Geological Survey, who has reviewed in the *Journal of Geology*, Jan.-Feb., 1900, the writer's "Gold Measures of Nova Scotia and Deep Mining," concludes by saying :

"This work of Mr. Faribault will be of immediate practical advantage to mining men, some of whom have already testified to its accuracy and value. It is another instance, lately of frequent occurrence, of geological work done from a purely scientific standpoint having direct economic value.

"From a scientific standpoint also, the results are of interest as illustrating a principle of ore deposition. In many districts, and particularly in the Lake Superior district, it has long been known that ore deposits were partial concentrates in pitching troughs by descending water. Van Hise has lately enunciated the principle that the openings in arches or pitching folds are favourable places for the concentration of ore deposits by *upward moving waters*. The formation of the gold-bearing veins in Nova Scotia seems likely to have occurred in this way."

### AUSTRALIAN DEEP MINES.

At Bendigo, Australia, fifteen mines are worked over 2,700 feet in depth, and eight over 3,000 feet; the deepest shaft on the Landell's 180 mine is over 4,000 feet deep. All these mines are operated on systems of anticlinal saddle-veins which do not outcrop at the surface, but have been developed successfully underneath one another by means of vertical shafts and by a series of cross-cuts and drifts driven every hundred feet (see cross-section of the Lazarus mine).

Much practical information may be obtained from the official reports of the Victoria Department of Mines at Melbourne, and other literature published on the subject in the transactions of the Australian Mining and Scientific Societies.

### SELECTION OF MOST FAVOURABLE PLACES.

The success of deep gold mining in Nova Scotia depends above all on the selection of the most favourable districts and the proper location of the vertical shafts, and this can only be done after a careful study of the structure and conditions peculiar to each district, irrespective of any other consideration or influence.

### CLASSIFIED LIST OF GOLD DISTRICTS.

It has been attempted, at the request of the Nova Scotia Government, in the following list to classify the different gold districts according to the geological structure and the size of the veins operated. (W. P. signifies that water-power is available.)

#### CLASS I.—SADDLE VEINS-

##### VERTICAL FOLDS:

(a) *Largest Saddle-veins:*

1	Dolliver Mountain .....	W. P.
2	Richardson.....	W. P.
3	Mooseland .....	W. P.

(b) *Smaller Saddle-veins and legs:*

1	Tangier, centre (free claim).....	W. P.
2	Oldham.....	
3	Caribou, on dome.....	

##### INCLINED FOLDS:

(c) *Largest Saddle-veins:*

1	Goldenville, east end.....	W. P.
2	Dufferin.....	W. P.

(d) *Smaller Saddle-veins and legs:*

1	Fifteen Mile Stream, east end, 3 anticlines...	W. P.
2	Moose River, north anticline.....	W. P.
3	East Waverley.....	W. P.
4	Killag	

(e) *Largest leg-veins:*

1	Renfrew, Foundation group (faults).....	W. P.
2	Goldenville, south dip at centre.....	W. P.
3	West Waverley.....	
4	Wine Harbor, east end.....	
5	Mount Uniacke, centre.....	
6	Gold River, Gammon leads.....	W. P.
7	Beaver Dam.....	W. P.
8	Cochran Hill, Mitchell group.....	
9	Harrigan Cove, immediately south of south anticline.....	
10	Lawrencetown, immediately south of north anticline.....	W. P.

(f) *Smaller leg-veins:*

1	Montague.....	W. P.
2	Goldenville, centre of Wellington zone.....	W. P.
3	Wine Harbor, centre.....	

4	Molega .....	W. P.
5	Isaac's Harbor, Mulgrave zone.....	
6	Lake Catcha.....	W. P.
7	South Uniacke.....	
8	Harrigan Cove, St. Anthony zone.....	
9	Country Harbor.....	
10	Kemptville.....	
11	Whiteburn.....	
12	Forest Hill.....	
13	Mill Village.....	W. P.
14	Gold River, south dip.....	W. P.
15	East Rawdon.....	
16	Miller Lake (Liscomb).....	W. P.
17	Pleasant River.....	
18	Brookfield.....	
19	Crow's Nest.....	
20	South Stewiacke.....	
21	Gold Lake (Scraggy Lake).....	
22	Head Chezzetcook.....	W. P.
23	Moosehead.....	
24	Carleton.....	
25	Ovens.....	
26	Ardoise.....	
27	Leipsigate.....	
28	Liscomb Mills.....	W. P.
29	Indian Path.....	
30	Vogler's Cove.....	
31	McKay Settlement.....	
32	Gegoggan.....	
33	West River, Sheet Harbor.....	

## SUBORDINATE CRUMPLES:

- 1 Isaac's Harbor, North Star and Hurricane Point crumple.....
- 2 Mt. Uniacke, West Lake crumple.....
- 3 Gold River, Vermilion lead crumple.....
- 4 Ecum Secum, Cameron lead crumple.....
- 5 Lawrencetown, Shanghai and Bennett crumple.

## CLASS II.—FISSURE AND CROSS VEINS.

- 1 Brookfield, Libbey's.....
- 2 Caribou, lake lode (Getchell's) and others.....
- 3 Leipsigate .....
- 4 Central Rawdon, Cope lode and others.....

5	Blockhouse.....
6	Cow Bay.....
7	Oldham.....
8	Lake Catcha.....
9	Vogler's Cove.....
10	Ardoise.....
11	Fifteen-mile Brook.....

#### FISSURE AND CROSS-VEINS.

In the above list the gold districts are divided into two distinct groups according to the class of veins operated, namely, *Class I*, the saddle-veins, following the planes of stratification along the crests of anticlinal folds, and *Class II*, the fissure or cross-veins, crossing the measures at various angles. The veins of the former class have hitherto been the principal source of the gold production, and they offer an extensive field for deep mining. A few of the fissure and cross-veins have also proved good producers, but they should not be considered in the present selection of a district for deep test-shafts; for, a deep shaft might prove the continuation of a chute of pay-ore within one fissure-vein to a greater depth than it is worked at present and would necessarily benefit the company operating; but, beyond this it would develop nothing new and would not attain the object in view, viz: to prove the recurrence in depth of a succession of numerous saddle-veins as rich and large as those actually outcropping and being worked at the surface.

In a few gold districts, like Caribou, Oldham and Lake Catcha, productive fissure veins and saddle veins have been worked quite close to one another and sometimes crossing each other. In no case, however, is it found possible to locate a vertical shaft that would advantageously develop conjointly both classes of veins.

#### LARGE SADDLE-VEINS PREFERABLE.

It is acknowledged by the best authorities that the development of the gold-fields in Nova Scotia has been retarded by the persistence of the prospector in neglecting for years the problem of large supplies of low-grade ore in favour of isolated rich veins. It is believed that the districts presenting the largest workable saddle-veins offer the best prospects for permanent and deep mining and should receive the preference. The deepest mines in the Australian gold-fields are operated on the largest saddle-reefs.

#### VERTICAL AND INCLINED SYSTEMS OF SADDLE-VEINS.

In locating a vertical shaft for deep mining, the dip of the anticlinal axis has to be taken into consideration, so that unnecessary

cross-cutting may be avoided. In the case of a vertical fold (see cross section of Tangier) like (*a*) and (*b*) in the above list, a vertical shaft would run parallel with its axis-plane, and very little cross-cutting would be necessary if the shaft is properly located, as it will keep in the pay-zone all the way down. But if the fold is inclined as at Goldenville (see cross-section of Goldenville) the vertical shaft would necessarily approach or recede from the axis plane as it is sunk to greater depth, according to its position with reference to the fold; and the deeper the shaft the more cross-cutting will have to be done to develop the pay-zone. *Underground developments on vertical folds will thus require to be less extensive and will cost much less than on inclined folds, and they should generally receive the preference for deep mining.*

#### VEINS IN CLOSE SUCCESSION.

For the same reason it is desirable that the saddle-veins should underlie one another in close succession, and on this point the Nova Scotia saddle-veins are more advantageous than those operated in Australia.

#### VALUE OF THE ORE.

The general value and character of the ore already extracted from the veins outcropping at the surface in a certain district should also represent a fair estimate of what the underlying veins may be like in that district.

#### WATER POWERS.

A district with a good water-power should also be given the preference over one where steam has to be used. The transmission of power by compressed air for short distances and electricity for longer distances has now been proved practicable and is being extensively used elsewhere, and it could be applied successfully at several gold districts in the province where important water-powers are lying idle on account of their being too far away to be utilized by other means. Now that gold mining is being established on a more permanent footing in the Province, it is desirable that more advantage should be taken of the water-powers, as this would greatly reduce the cost of operation.

#### CHOICE OF COMPANY.

A good, strong, bona fide mining company that has already given proof of its ability should be preferred to a new company with no practical experience in mining, or one being formed with the special purpose of taking advantage of the Government's offer, unless the

engineer in charge is especially qualified for such undertaking, and the directors are good reliable business men.

#### LOCATING DEEP SHAFTS.

The proper location of a vertical shaft is even of more importance than the selection of the district, for in most districts a vertical shaft well located, with properly directed underground developments, may prove successful, while in the most promising districts the results may be otherwise if the shafts and developments are not well located.

#### IMPORTANCE OF CROSS-CUTS.

Second in importance to the location of the shaft, is the problem of properly planning out the system of underground developments to be carried out from each shaft, viz.: the direction and length of the cross-cuts and drifts to intersect the zone of pay-ore. It has been shown above that in the case of an inclined fold, much cross-cutting is required to intersect the pay-zone, otherwise the vertical shaft would be of little use. The necessity of cross-cutting is well shown in the section given of the vertical shaft sunk at Lazarus Mine, Bendigo.

#### CROSS CUTS UNDER CONTROL OF GOVERNMENT ENGINEER.

Thus to ensure success, the Provincial Government should retain the control of the underground developments, and it might be desirable that Government aid should be extended to necessary cross-cutting and drifts which might be driven at successive levels, a few hundred feet apart, as the case required, this to be determined by the Government engineer in charge.

#### TESTS.

The Government should also see that the veins intersected be carefully sampled and assayed and separate mill-tests made of the most promising, in order to determine the workable portions and pay-chutes. Such mill-tests should be under the direct supervision of the Government engineer, or some competent person appointed by him, who should take samples of the tailings at regular intervals during the mill run and have them assayed.

#### UNDERGROUND PLANS AND SECTIONS.

It is very desirable that the structure of the strata and veins intersected be recorded on a large-scale plan before the rock is concealed by the timbering of the shaft. A complete set of underground plans and sections should also be kept constantly up to date

of the cross-cuts, drifts, winzes, rises, etc., showing the values, sizes and structure of the different veins opened up. Such plans would show the distribution of the workable ore-bodies within the area developed, and also assist in defining the direction and extent of the pay-zone and in laying out the development work.

It is believed that the Government should have a competent officer, especially appointed to superintend the sinking of the three proposed shafts, to make surveys and to keep plans of the underground workings in order to determine what cross-cuts, drifts, etc., should be made so as to properly develop the pay-ground.

E. R. FARIBAULT,  
*Geologist to the Geological Survey.*

Ottawa, 24th July, 1903.

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## APPENDIX (A)

The following observations and plans are taken from the Summary Report of the Geological Survey of Canada, 1902, by E. R. Faribault (to be published this month) on the important development recently made on the arch-core of the anticlinal folds at the Bluenose, Dufferin, Richardson and Dolliver Mountain mines :

### GOLDENVILLE.

### BLUENOSE MINE.

Much credit is due to the late Mr. Simson A. Fraser for having first undertaken, and Messrs. Thos. Cantley and A. G. McNaughton for having executed so successfully at the Bluenose mine, a new system of mining development on the Goldenville anticlinal fold, which should be an object lesson for the gold miners of the province.

#### *Transverse Section.*

A detailed survey was made on October 15th last of the new developments, and a transverse section was prepared which is here reproduced on a reduced scale. The section is made through the main shaft on the Springfield belt, and along two cross-cuts driven north, one above the other, at the depths of 280 and 364 feet, and at a distance of 30 feet west of the main shaft. The upper cross-cut is 230 feet and the lower 250 feet long. They show the structure of the Goldenville anticlinal fold, with a subordinate small flexure on the north leg, and disclose the recurrence of large auriferous saddle-veins, from the surface to below 364 feet.

The saddle-veins are remarkably well developed on the apex of the fold, where they attain a large size, and they continue downwards very regularly on both legs, the veins diminishing but little in size, more especially on the south leg, which goes to prove that they will extend to a great depth as well as parallel with the anticlinal.

Most of the veins developed have proved auriferous, and two of them, the McNaughton belt on the south dip and the Cantley belt on the north dip, have already been profitably worked.

*McNaughton Belt.*

The McNaughton belt measures 6 feet 8 inches in width at the upper level and 6 feet at the lower, and is composed of large irregular quartz rolls and stringers pitching westerly 15 to 22 degrees in slate and a few thin layers of whin. It has been opened 300 feet in length on the upper level and 500 feet on the lower, and the greater part of the block of ore between the two levels has been extracted by backstopping. A rise of 65 feet has been made above the upper level, where the belt has widened to 8 feet and 10 inches and begins to curve towards a saddle higher up. The official returns of the ore extracted from the McNaughton belt for the year 1902 are 11,211 tons, yielding 2,391 ozs. of gold, which is very satisfactory, considering the size of the vein.

The Springfield belt was profitably worked to a maximum depth of 400 and a length of 900 feet, and is still found auriferous at the bottom of the main shaft, which is being sunk some 50 feet deeper for a third cross-cut to develop new saddles and backstop the McNaughton and probably the Faribault belt. The South Springfield belt was mined 113 feet in depth and 242 feet in length.

*Pay Zone on South Dip.*

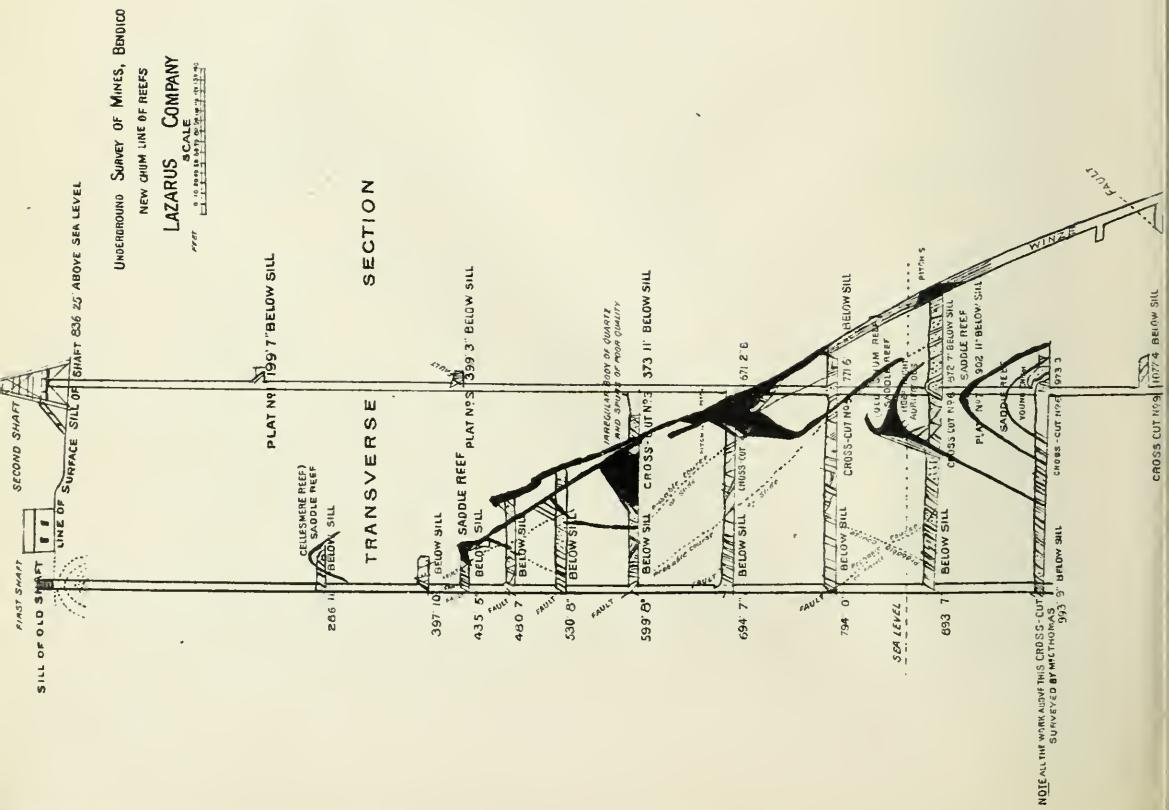
As the McNaughton belt has been profitably mined almost to the apex of the fold, 145 feet above the lower level, we may conclude that the denuded portion of the Springfield belt, about 150 feet, has pay-ore, which added to the depths worked, 400 feet, would give a possible total depth of 550 feet of pay-ore on the south dipping leads. The McNaughton belt may therefore be expected to carry pay-ore for 400 feet deeper than the 364 feet level.

On the south dip the zone of pay-veins is thus 150 feet in width and lies immediately south of the anticlinal axis along which it extends to great depth, unless a change should be found in the structure of the fold, of which there is so far no indication.

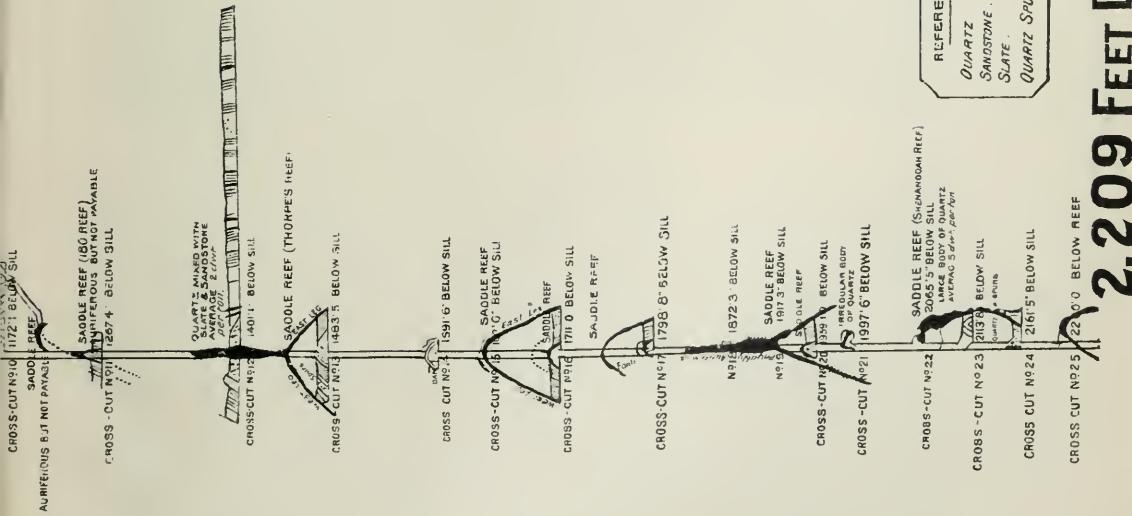
In length the Springfield belt has been profitably worked for over 900 feet, and there is good reason to believe that if properly de-



# The Gold Measures of No.



# Scotia and Deep Mining.





veloped will be found to carry pay-ore for a much greater length and the McNaughton belt will probably be workable for as great a length. A continuous zone of pay-veins has been worked to limited depths all along the south limb of the Goldenville anticlinal fold, for a length of 4,400 feet from the Springfield to the Palmerston belt, beyond which development works have been prevented by the swampy nature of the ground. The surface developments are sufficient to prove that this zone affords a field of virgin ground, large enough for several mines like that operated by the Bluenose Company.

#### GEO. W. STUART'S NEW SHAFT.

Mr. George W. Stuart is also at present sinking a shaft on area 743, and 75 feet west of the open cut on the Palmerston belt, in order to develop the zone of pay veins, which has proved very rich in gold in this vicinity, by a system of cross tunnels and drifts at different levels.

#### *Pay Zone on North Dip.*

The developments on the north dip at the Bluenose mine have not yet been sufficient to determine the pay zone, but on the Cantley belt they show that the workable portions of the veins are restricted to certain parts of the subordinate flexure occurring on the north limb of the main anticline, and further developments will, no doubt, determine some well defined zones of pay-chutes pitching like the flexure, easterly  $20^{\circ}$ .

#### ROYAL OAK MINE.

The most regular and continuous pay-chutes worked in Goldenville were operated on the north dip. In the plan and report of that district published in 1897, three zones of pay-chutes are given: the Wellington, Hayden, and McRae lines of pay-chutes. In the Summary Report for the same year, page 109, referring to the Hayden line of pay-chute, I said: "A swamp lying north-west of the Little Hayden has, no doubt, prevented prospecting further north-west on this undulation, but there is every reason to believe that rich streaks occur there." It is gratifying to learn that this prediction has been fulfilled and several rich pay-chutes have since been developed with a great deal of skill by Mr. Wm. McIntosh, the superintendent of the Royal Oak Mine, and for the year 1902, 4310 tons of ore have yielded the handsome return of 2394 oz. 16 dwts. of gold.

## SALMON RIVER GOLD DISTRICT.

### DUFFERIN MINE.

A general description of the mining developments on the arch-core of the anticlinal fold at the Dufferin mine has already been given in the Summary Report for 1899, page 183, and a transverse section showing the structure of the saddle veins is now ready for publication. This section shows that a vertical shaft 420 feet deep with cross-cuts across the anticlinal fold at 134, 200, 315 and 420 feet levels, have developed a succession of superimposed saddle-veins which do not crop at the surface, five of which have been worked between the surface and the 315 feet level. This mine has been one of the best gold producers in the Province, 117,906 tons of ore treated having yielded 41,497 oz. 5 dwts. 20 grs. of gold valued at \$788,448, giving an average of 5 dwts. 20 grs. per ton of 2000 lbs. Through one cause or another, the mine is at present idle, but will, undoubtedly, be taken in charge by some skilful mining engineer and developed intelligently and operated as successfully as before, as has been the case with several other abandoned mines lately reopened.

### UPPER ISAAC'S HARBOUR GOLD DISTRICT.

A special plan of this district, also called Upper Seal Harbour, was made in 1897, and descriptive notes were published in the Summary Report for that year, in which it was pointed out, at page 106, that "large belts of low-grade ore, conforming with and similar to that of the Richardson vein, certainly occur along this fold, but they will only be found on the apex of the fold, along which more prospecting should be done, and this could be accomplished most readily and at least cost by sinking vertical shafts along the axis." This recommendation has since been successfully put into practice at the Richardson and Dolliver Mountain mines.

The production to date of this district shows 73,314 ounces of gold from 226,355 tons of ore treated.

### RICHARDSON MINE.

At the Richardson mine a vertical shaft was sunk 160 feet in depth, about 900 feet to the eastward of the cropping of the apex of the Richardson vein, intersecting at the depth of about 100 feet the south leg of an overlying saddle-vein giving ten feet of quartz and slate, which was developed at the depth of 160 feet by a drift 60 feet eastward and a cross-cut 84 feet long to the north leg,

where it shows six feet of ore. The character of the ore and the structure of the saddle-vein is identical with that of the Richardson vein, but for some reason or other the work of sinking has been stopped. The property, however, has been acquired by a strong American Company, who contemplate important mining developments by means of a vertical shaft with up-to-date equipment, and alterations are already in progress. It is reported that the large cyanide plant is to be replaced by a new process of gold extraction and the 60 stamp mill improved and 20 more stamps added.

#### DOLLIVER MOUNTAIN MINE.

At Dolliver Mountain, on the same anticline and one mile west of the Richardson mine, Mr. G. J. Partington has, during the last two years, developed in a very skilful manner a succession of large saddle-veins similar to the Richardson.

The exact position and direction of the anticline and the structure and value of three superimposed anticlinal saddle-veins outcropping at the surface were first ascertained by Mr. Partington. These are the Howard, Forge and Partington saddle-veins, measuring respectively 10, 30 and 33 feet vertically on the apex, the former pitching eastward  $12^{\circ}$  and the latter  $16^{\circ}$ .

#### *Vertical Shaft.*

A vertical shaft 17 ft. 6 in. by 5 ft. 3 in. in the clear, was then sunk on the anticline, on area 774, at a distance of 400 feet eastward of the cropping of the Partington belt, to intersect the three saddle-veins as well as others underlying at their apex. After going through 55 feet of quick sand, small veins were intersected at depths of 55, 92 and 102 feet, which, although not apparently of workable size, proved the shaft to be exactly on the apex of the fold. At the depth of 130 feet the Partington saddle-vein was intersected. It measures about 33 feet in thickness on the apex, is being developed on the north and south legs, and has yielded about 6000 tons of auriferous ore, highly mineralized, composed of rolls, bunches and stringers of quartz running through a belt of slate and resembling much that of the Richardson mine.

The shaft was on May 25th, 257 feet deep and the company is wisely continuing sinking without interruption, until 1000 feet has been reached. It will thus intersect successively the Forge and Howard veins and a great number of other new underlying saddle-veins, on the apex of the fold, where they are of greater size and value.

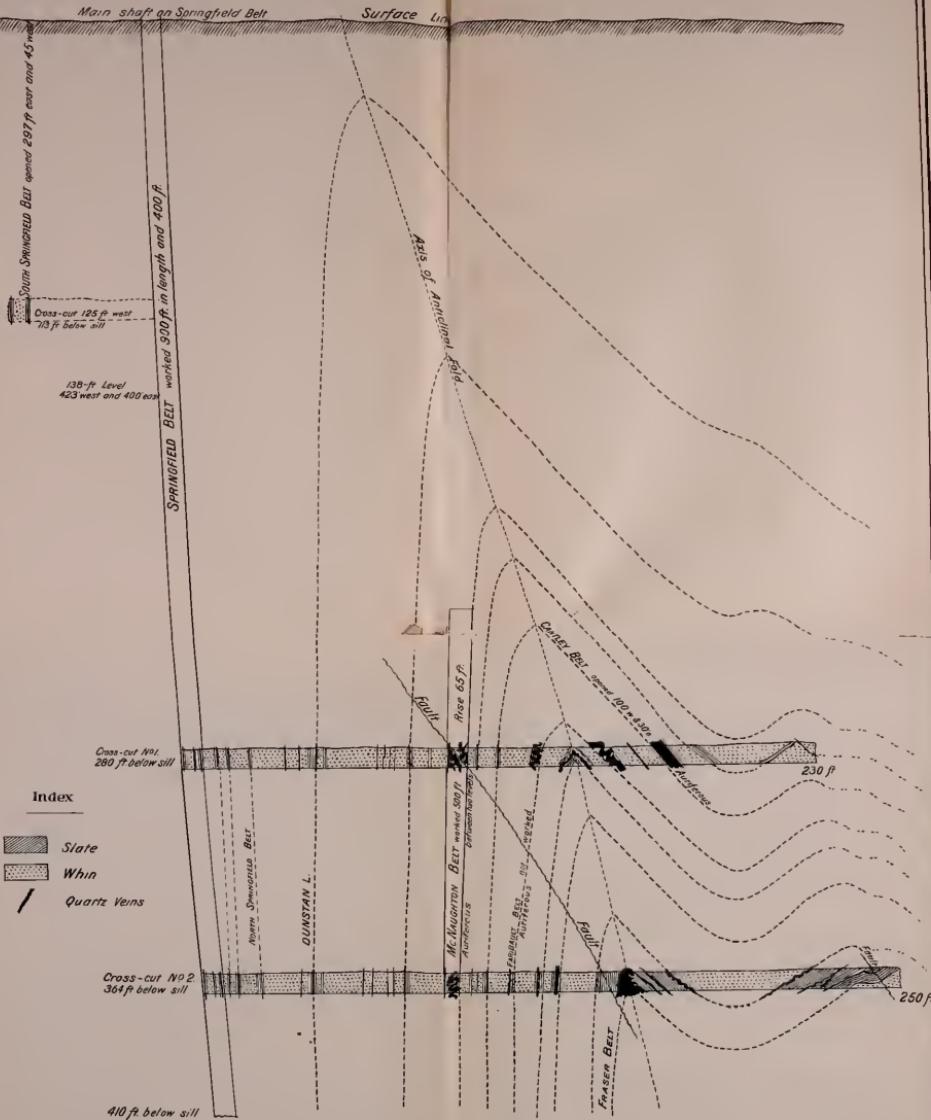
*Plant.*

The company is erecting a large modern plant, and they have a fine water-power at the head of the tide on Isaac's Harbor River, capable of generating 750 H. P. The power is transmitted to the mine by electricity, where an electrical hoist and a fifteen-drill air compressor have been installed, and an eighty stamp mill in which forty stamps are to be used at once.

*Developments Based on the Structure.*

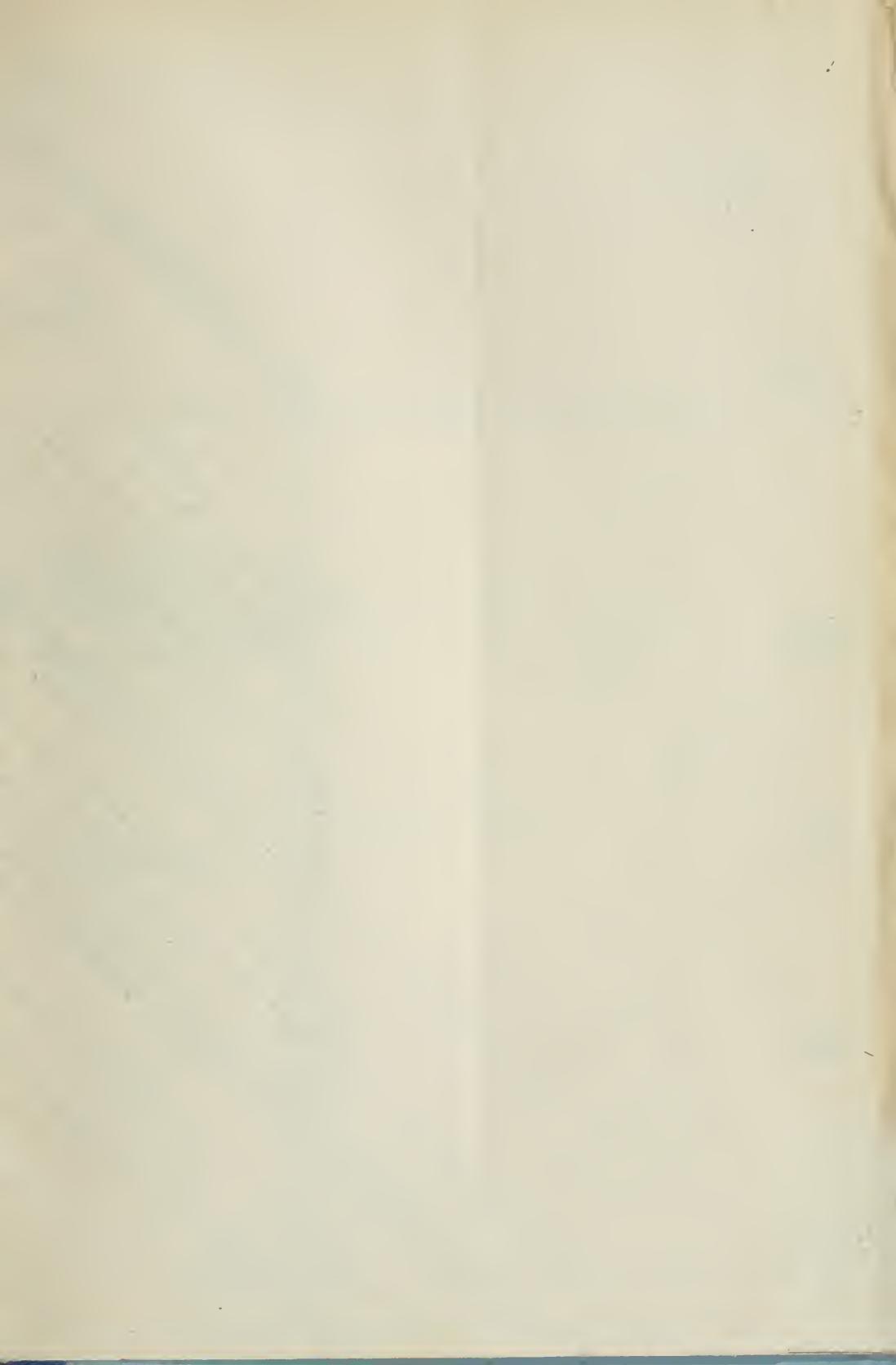
These operations are well worth recording as the first instance in Nova Scotia where a series of saddle-veins has been systematically developed, with due regard to its geological structure and a proper knowledge of its possibilities for extensive and permanent mining. What has been accomplished at the Doliver Mountain mine can also be done along Upper Isaac's Harbour anticlinal fold and in many other districts in the Province where the conditions are favorable.





TRANSVERSE VERTICAL SECTION  
Through Main Shaft and Cross-cuts  
**BLUENOSE GOLD MINE,  
GOLDENVILLE, NOVA SCOTIA.**

A horizontal scale labeled "Scale of feet." at the top center. The scale has major tick marks every 10 units, labeled 10, 20, 30, 40, 50, 60, 70, 80, 90, 100, and 110. The scale starts at 10 and ends at 110.



*ROSS - SECTION  
OF  
GOLDENVILLE GOLD DISTRICT  
NOVA SCOTIA.*

BY  
E.R. Faribault, B.A.Sc.

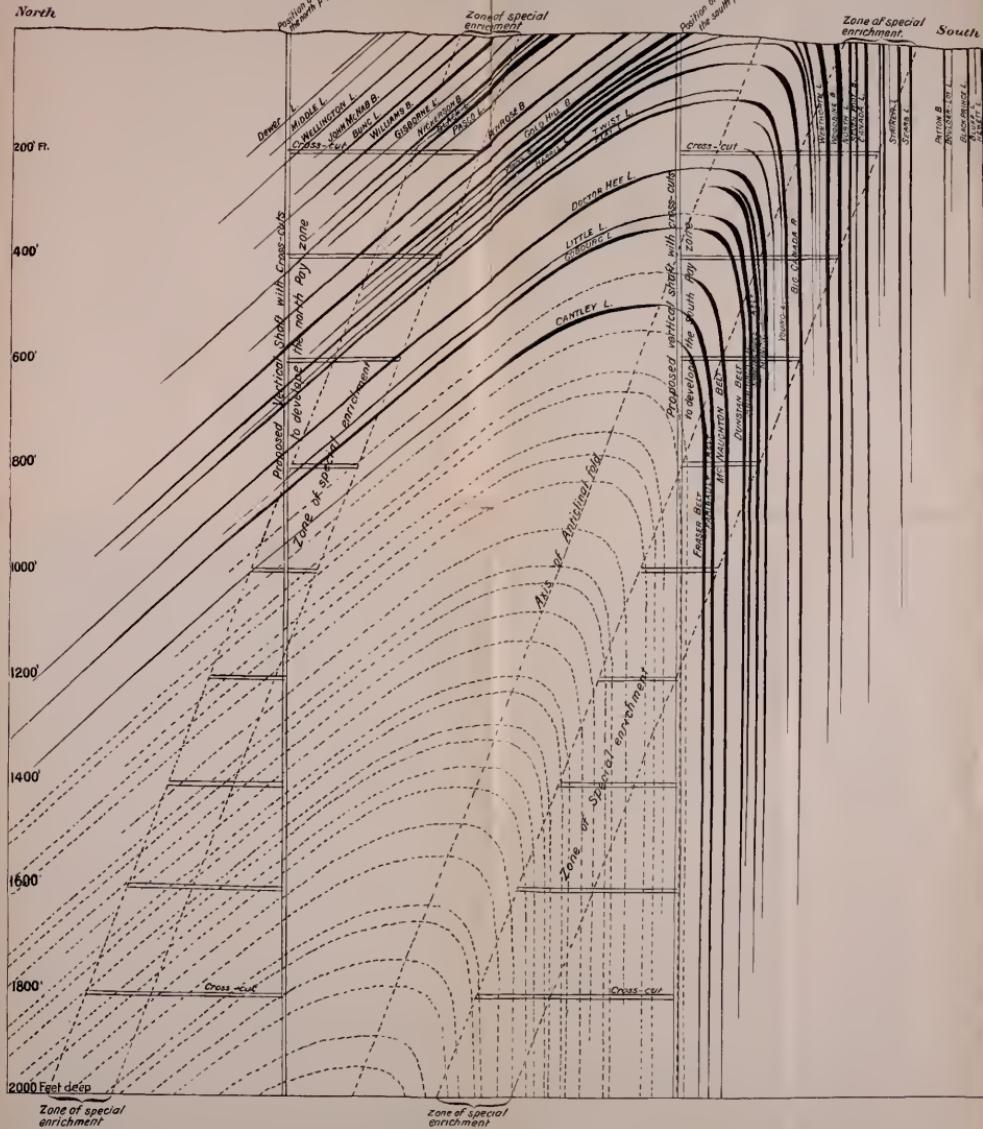
Scale in feet

Scale in feet.

100 75 50 25 0

Norde

## *South*



*Example of an INCLINED ANTICLINAL FOLD requiring vertical shafts with CROSS-CUTS to develop the pay-zones to best advantage*

UNIVERSITY OF TORONTO

RETURN TO

